UNIVERSITY OF VIRGINIA

UNIVERSITY OF VIRGINIA ACQUISITION OF PASSENGER RIDE QUALITY DATA ABOARD THE TOTAL IN-FLIGHT SIMULATOR (TIFS)

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Short-Haul Air Transportation Program

by
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Department of Engineering Science and Systems

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SUMMARY

The "In-Flight Simulator Investigation of Passenger Subjective Response to Vehicle Motions" (ref. 1) was a cooperative effort among the V/STOL Aircraft Projects Office and Aerospace Dynamics Branch at NASA/Langley Research Center; the Department of Psychology, Hampton Institute; and the Department of Engineering Science and Systems, University of Virginia. This report describes the preparation, implementation, and results of the test flights made in support of the University of Virginia investigations.

The Total In-Flight Simulator (TIFS) aircraft is a C-131H owned by the U.S. Air Force Flight Dynamics Laboratory and operated by Calspan Corporation of Buffalo, New York. Pre-recorded signals were converted into controlled aircraft motion for evaluation by ten subjects on a seven-point rating scale. Eighteen test flights were flown in August and September 1974 for the University of Virginia, the results of which are to be used in validation studies on ground-based simulators at NASA/Langley Research Center and to extend passenger response models developed at the University of Virginia.

The first series of test flights occurred in the four-day period August 12-15, 1974. A hydraulic problem cancelled flights on August 16, and a required 100-hour inspection of the aircraft postponed the remaining University of Virginia flight tests until September 13, 14, and 16, 1974.

OBJECTIVES

The purpose expressed (ref. 1) for using the airborne simulator include:

1. The establishment of baseline data for comparison of passenger subjective responses (PSRs) to actual

flight motions with PSRs to similar motions reproduced on ground-based simulators, and

2. The investigation of PSRs to motions occurring in commercial flight regimes but not easily reproducible in ground-based simulators.

The University of Virginia was asked to be responsible for experiments involving PSRs to isolated and combined motions as indicated in table I.

TABLE I.- AREAS OF FLIGHT TEST INVESTIGATION

Type of Motion	Number of Flights
Sinusoidal	
Low frequency vertical and transverse accelerations	5
Low frequency roll rates	2
Random	
Vertical and transverse accelerations	3
Vertical acceleration (isolated)	2
Roll and yaw rates	3
Narrow bandpass frequency effects	3

APPROACH

The eighteen test flights were ordered so as to present to the subjects a variety of combinations of motion. This approach was used to assist subjects in judging on the basis of their own comfort, rather than acting as motion amplitude meters comparing one flight to another.

Each twenty-segment flight was composed of two independent ten-segment tests in which five unique levels of motion were presented in random order with smooth transitions and repeated in random variation.

Ten test subjects per flight were asked to evaluate each of the twenty segments using a seven-point rating scale and entering observations or comments into a written log. Each segment was two minutes long. Twenty seconds after

the beginning of the segment, an announcement over the aircraft public address system directed subjects to begin the evaluation and indicated the current segment identification number. Eighty seconds later another announcement directed subjects to record subjective responses and comments. Subject response sheets (see figure 1), clipboards, and pens were provided for that purpose. Responses were selected from the seven-point scale printed in the upper left corner of each response sheet.

Subjects were briefed prior to each day of flying concerning scheduling, use of the response sheets, and safety procedures. Subjects were debriefed informally following each flight and more formally at the end of each day of flying. Aircraft and subject schedules necessitated more concentrated flight exposures (up to four flights per day) than would have been preferred (one flight in the morning and one in the afternoon). Rest periods of thirty to forty-five minutes out of the aircraft were provided between flights, with sixty to ninety minutes for lunch.

Experience gained in previous flight tests indicated the inability of some subjects to separate environmental factors affecting judgments of comfort. Rather than have subjects attempt to isolate the effects of motion on subjective response, they were asked to respond to the total passenger environment, including motions, noise, vibration, temperature, pressure, etc.

TOTAL IN-FLIGHT SIMULATOR

The Total In-Flight Simulator (TIFS) is a Convair C-131H, a version of the Convair 580 modified by the addition of direct lift flaps, side force surfaces, and control systems to provide variable stability flight capabilities through an onboard computer. For this research effort, analog tapes were created to provide controlled inputs to the computer which operated the control surfaces to produce desired levels of motion.

An extensive automatic safety trip system guarded against motion amplitudes or control surface deflection rates which exceeded preset limits. In several instances, these limits restricted the motion levels desired for the tests (especially for random roll and yaw) and this restriction resulted in the elimination of several tapes from the sequence of experiments.

The aircraft cabin was divided by opaque curtains into three sections: the cockpit area, the test subject area, and the computer area (see figures 2 and 3). The test subject area was outfitted with airline-type adjustable seats, carpeting, and paneling to cover power and hydraulic consoles. The seats were of two types. Those numbered 1 through 6, located left of the aisle had cushions measuring 50.8 cm (20 inches) deep and 45.7 cm (18 inches) in width. The seat back was 66 cm (26 inches) above the cushion which, when unoccupied, was 45.7 cm (18 inches) above the floor. Seats 7 through 10 had cushions 45.7 cm (18 inches) square and 42 cm (16.5 inches) above the floor. Seat backs in this type were 69 cm (27 inches) high. Both types of seats had 7.6 cm (3 inch) wide arm rests and 37 cm (14.5 inches) knee room between seat pairs. Seats 1, 2, 7, and 8 had at least 61 cm (24 inches) of leg room.

Located behind the ten subject seats were the test observer and camera operator, one of whom remained in voice contact with the crew.

The University of Virginia Portable Environmental Recording Systems (PEMS I AND II) were positioned in front of and operated by the observer. Only one of the two systems was operated at any given time.

Temperature control of the cabin proved somewhat difficult. The demands placed on the air conditioning system by the warm weather and sun, while the aircraft was on the ground between flights, frequently exceeded the system's capacity. Uneven air distribution and system lag time further complicated the effort to achieve uniform and comfortable temperatures for the flight tests. When feasible, higher test altitudes were requested to take advantage of lower outside air temperatures.

Test subjects occasionally experienced some discomfort due to pressure changes in the unpressurized cabin. Most such occurrences were during descent portions of flight although on several occasions, the effects were noticeable during the flight tests.

Noise level was generally above 88 dB(A) throughout the test period of each flight, in some test subject seats as high as 100 dB(A). (Refer to figures 4 and 5.)

DRIVE TAPE PREPARATION

Motion levels were selected to provide a reasonable distribution of subjective responses, based on data from previous flight experiences. The simulator was operated in a four-degree-of-freedom mode, providing control over vertical acceleration, transverse or lateral acceleration, roll rate, and yaw rate.

Tape generation was accomplished by amplifying and filtering random and sinusoidal inputs using an analog computer at NASA/Langley Research Center. Potentiometers were manually adjusted according to a prepared script to provide appropriate new rms levels every two minutes, with smooth transitions between segments. Discontinuities would have resulted in aborts by the automatic safety system aboard TIFS.

Drive tapes are seven-track, wide-band FM, recorded at 3-3/4 ips (identified as TIFS Driving Tapes (TDT) -1 through -16) with track assignments and conversions as follows:

Track	Variable	Conversion
1	Vertical acceleration	0.625 g/volt
2	Transverse acceleration	0.299 g/volt
3	(not recorded)	
4	Roll rate	12.55 deg/sec/volt
5	Yaw rate	7.75 deg/sec/volt
6	NASA 36 time code	FM
7	NASA 36 time code	Direct

TEST SUBJECTS

For each flight, ten subjects were chosen from a pool of twenty-six volunteers, thirteen men and thirteen women. Five were NASA employees; seven were students or employees of the University of Virginia; thirteen were students or employees of Hampton Institute; and one was nonaffiliated. Eight were 18-20 years old; nine were 21-25; three 26-30; five were 31-35; and one was in the 36-40 category. Ten could be considered experienced subjects,

having participated in previous flight programs; three additional subjects had some previous affiliation with flight research or piloting an aircraft; and thirteen were considered not experienced as subjects. Hampton Institute subjects were paid for their participation.

Subjects were not pre-tested or screened prior to the test flights, nor were training flights available to provide rating experience for naive subjects. During the test flights, it was discovered that one subject's responses were pre-determined by the subject's attitude toward given flights and a few subjects tended to doze during tests. In some cases several test flights and debriefings were completed before subjects fully understood the nature of the judgments requested.

In order to provide a context for individual responses, the following information was provided by each subject:

1. Age
2. Total number of flights (lifetime)
3. Number of flights (last two years)
4. Types of aircraft
5. Attitude towards flying.

After having performed the evaluation tasks on one or more test flights, each subject was asked to describe in detail his or her interpretation of each point of the seven-point comfort rating scale. This contextual information is summarized by subject code number in appendix B. Individual subject responses to each flight segment are given in appendix A.

An effort was made to provide both continuity and variety in the subject population. Thirteen subjects made less than five flights each; five subjects participated in five to nine flights each; and eight subjects each flew ten to eighteen test flights.

TEST PROTOCAL

Provision was made for four test flights per day under acceptable weather conditions. The planned schedule is listed below:

0800-0825	Subject briefing, coffee
0830-0840	Board TIFS aircraft
0840-0900	Taxi, takeoff, climb to test altitude
0900-0940	First test flight
0940-1000	Descend, land, subjects deplane
1000-1025	Break
1030-1035	Reboard TIFS
1035-1100	Taxi, takeoff, climb to test altitude
1100-1140	Second test flight
1140-1200	Descend, land, subjects deplane
1200-1215	Debriefing
1215-1300	Lunch
1300-1310	Reboard TIFS
1310-1330	Taxi, takeoff, climb to test altitude
1330-1410	Third test flight
1410-1430	Descend, land, subjects deplane
1430-1500	Break
1500-1505	Reboard TIFS
1505-1530	Taxi, takeoff, climb to test altitude
1530-1610	Fourth test flight
1610-1630	Descend, land, subjects deplane
1640-1700	Debriefing

This schedule was followed closely when operating under Visual Flight Rules (VFR) conditions, but delays were occasionally encountered. When weather conditions necessitated Instrument Flight Rules (IFR) operation, approximately forty minutes additional flight time was required for departing from and returning to Langley Air Force Base. Flights with durations exceeding ninety minutes were followed by refueling, requiring thirty to fifty minutes.

Subject Briefings

First time subjects were introduced to each other and to the rest of the group and given a brief explanation of the test purposes, schedule, safety aspects, and procedures for terminating a test if anyone should so desire. The use of the subject response form was explained and seat assignments were made.

Debriefings

Informal debriefing following each flight was attempted by involving individuals or small groups in conversations. Questions were answered, instructions clarified, and comments noted by the observers, test conductor, or member of the research team. More formal debriefing sessions were scheduled at the end of each flight day.

DATA RECORDING SYSTEM

The University of Virginia provided two carry-on motion recording systems for use in data acquisition. These were designed and constructed at the University of Virginia for use in ride quality research programs. These Portable Environmental Measuring Systems, PEMS I and PEMS II, were located near the aircraft center of gravity and provided six-degree-of-freedom motion recording capability (except on two flights, 349 and 350, when data were lost due to a blown fuse in a circuit providing power to an output amplifier). The TIFS aircraft is also equipped with a data recording system, but at the time of this writing, our processing of the Calspan-recorded data was incomplete.

This report treats only the data recorded on the University of Virginia systems and reduced at the Data Transcription Facility at NASA Langley Research Center. The following results are based on those data.

RESULTS AND DISCUSSION

These results and conclusions are based on apparent functional relationships between subjective responses and the degree(s) of freedom intended as inputs to the test. Total motion experienced by the subjects is more fully described by the six-degree-of-freedom summary contained in appendix C.

The ranges of sinusoidal and random vertical and transverse accelerations measured are indicated graphically in figures 6 and 7. Mean subjective responses are plotted versus variable motions in figures 8 through 23, in accordance with the table below. The range and types of motion for each test are summarized in table III.

TABLE II.- GUIDE TO MOTION/RESPONSE GRAPHS

Motion	Flights	Figures
Sinusoidal vertical and transverse accelerations	355	8
	327	9
	352	10
	356	11
Sinusoidal roll rate	326	12
	334	13
Random vertical and transverse accelerations	325	14
	353	15
	359	16
Rardom vertical acceleration	357	17
Random roll and yaw rates	328	18
	354	19
	358	20
Narrow bandpass frequency effects on random vertical and transverse accelerations	332	21
	333	22
	351	23

Sinusoidal Vertical and Transverse Accelerations

The first ten segments of Flight 355 presented to the subjects various amplitudes of 1.0 Hz sinusoidal transverse acceleration as the test motion stimulus. The remaining ten segments exposed them to 1.0 Hz vertical sinusoidal acceleration levels. Although neither of these motions is generally encountered in flight, the response data may be used in relating the University of Virginia TIFS subject group with subjects used in classic simulator studies.

It is of interest to note in figure 8 (Flight 355) that subject sensitivity to transverse acceleration is approximately three times that to vertical acceleration (each sinusoidal at 1 Hz), as indicated by the slopes of the graphs shown.

Flights 327, 352, and 356 presented to the subjects 0.3 and 1.0 Hz vertical sinusoidal accelerations in combination with 0.5 Hz transverse sinusoidal accelerations. Figure 24 is a comparative summary of the least squares linear fits of the mean responses to the various combinations for a 1 Hz vertical and 0.5 Hz lateral acceleration combination showing a monotonic degradation of comfort level with increasing amplitudes of transverse acceleration.

TABLE III.- TEST FLIGHT SUMMARY

TIFS FLIGHT	TDT	SEGMENTS	VERTICAL ACCELERATION g rms	TRANSVERSE ACCELERATION g rms	ROLL RATE rad/s rms	YAW RATE rad/s rms
325	1	1 - 10	R[†] 0.023	R 0.017 - 0.071	--	--
		11 - 20	R 0.044	R 0.017 - 0.066	--	--
326	15	1 - 10	--	--	S*(1 Hz) 0.015 - 0.075	--
		11 - 20	--	--	S (0.5 Hz) 0.016 - 0.081	--
327	12	1 - 10	S (0.3 Hz) 0.037 - 0.16	S (0.5 Hz) 0.0525	--	--
		11 - 20	S (1 Hz) 0.021 - 0.10	S (0.5 Hz) 0.0859	--	--
328	2	1 - 10	--	--	R 0.0096	R 0.004 - 0.009
		11 - 20	--	--	R 0.022	R 0.002 - 0.01
332	8	1 - 10	R (0.3 - 1 Hz) 0.03 - 0.15	R (0.3 - 1 Hz) 0.057	--	--
		11 - 20	R (0.3 - 1 Hz) 0.03 - 0.156	R (0.3 - 1 Hz) 0.022	--	--
333	10	1 - 10	R (0.7 - 1 Hz) 0.03 - 0.15	R (0.7 - 1 Hz) 0.014	--	--
		11 - 20	R (0.7 - 1 Hz) 0.03 - 0.14	R (0.7 - 1 Hz) 0.025	--	--
334	3	1 - 10	--	--	S (0.3 Hz) 0.02 - 0.20	--
		11 - 20	--	--	S (0.1 Hz) 0.04 - 0.21	--
349	6	1 - 10				
		11 - 20				
350	14	1 - 10				

[†]R - Random Input *S - Sinusoidal Input

TABLE III.- CONTINUED

TIFS FLIGHT	TDT	SEGMENTS	VERTICAL ACCELERATION g rms	TRANSVERSE ACCELERATION g rms	ROLL RATE rad/s rms	YAW RATE rad/s rms
351	9	1 - 10	R (0.1 - 1 Hz) 0.026 - 0.11	R (0.1 - 1 Hz) 0.027	--	--
		11 - 20	R (0.1 - 1 Hz) 0.033 - 0.124	R (0.1 - 1 Hz) 0.075	--	--
352	14	11 - 20	S (1 Hz) 0.021 - 0.106	S (0.5 Hz) 0.087	--	--
353	4	1 - 10	R 0.063	R 0.015 - 0.06	--	--
		11 - 20	R 0.034	R 0.013 - 0.06	--	--
354	11	1 - 10	R 0.018	R 0.012	R 0.008 - 0.0185	R 0.0013 - 0.0094
		11 - 20	R 0.018	R 0.012	R 0.011 - 0.054	R 0.0013 - 0.011
355	13	1 - 10	--	S (1 Hz) 0.0148 - 0.065	--	--
		11 - 20	S (1 Hz) 0.03 - 0.13	--	--	--
356	16	1 - 10	S (0.3 Hz) 0.04 - 0.18	S (0.5 Hz) 0.096	--	--
		11 - 20	S (1 Hz) 0.02 - 0.11	S (0.5 Hz) 0.022	--	--
357	6	1 - 10	R 0.03 - 0.12	--	--	--
		11 - 20	R 0.035 - 0.15	--	--	--
358	11	1 - 10	R 0.034	R 0.025	R 0.003 - 0.015	R 0.004 - 0.0105
		11 - 20	R 0.034	R 0.025	R 0.008 - 0.0385	R 0.002 - 0.016
359	4	1 - 10	R 0.063	R 0.014 - 0.071	--	--
		11 - 20	R 0.037	R 0.016 - 0.066	--	--

Sinusoidal Roll Rate

Four frequencies of sinusoidal roll rate were investigated: 0.1, 0.3, 0.5, and 1.0 Hz, on Flights 326 and 334. Figures 12 and 13 show the mean subjective responses and roll rate amplitudes for individual flight segments. Figure 25 summarizes the results, indicating that a roll rate of 0.3 Hz was judged the most comfortable of the four frequencies tested. At each frequency, ratings degraded with increasing amplitude roll rates. Subject comments noted motion similarities ranging from rocking in a cradle to tossing in a boat.

Random Vertical and Transverse Accelerations

Flights 325 and 353 had eight subjects in common and Flight 359 had four in common with the first two flights. The responses indicated that the levels of constant random vertical acceleration experienced in this series of flights (0.024, 0.034, 0.045, and 0.063 g rms) produced no consistent effect in combination with the levels of transverse acceleration. For any given level of constant random vertical acceleration, the random transverse acceleration (ranging from 0.013 to 0.071 g rms) produced reasonably linear responses by the groups of subjects, as shown in figures 14, 15, and 16.

Random Vertical Acceleration

The results of Flight 357 are displayed in figure 17. Points for segments 1, 2, 5, and 6 are missing due to data reduction problems. Once again, subject responses were relatively less sensitive to vertical acceleration below 0.08 g rms. A linear least squares fit of data in segments 11-20 yields the equation: $C = 2.14 + 14.3\ \bar{a}_v$ where C is the subjective comfort level and $\bar{a}_v$ the rms vertical acceleration. This equation agrees quite well with previous data (ref. 2) taken onboard commercial airline flights.

Random Roll and Yaw Rates

The TIFS system was unable to provide sufficient magnitudes of simultaneous random yaw and roll rates to generate useful data. Flights 328, 354, and 358 were intended to investigate the effects of these random degrees of freedom on subjective response. As can be seen from figures 18, 19, and 20 the low values

of mean subjective response and absence of strong functional relationships indicate that the motions experienced did not affect subject sensitivity.

Narrow Bandpass Frequency Effects on Random Vertical and Transverse Accelerations

Flights 332, 351, and 333 presented filtered motions to the subjects. Bandpass frequencies of 0.3 to 1.0 Hz, 0.1 to 1.0 Hz, and 0.7 to 1.0 Hz, respectively, were the desired regions of investigation. Figures 21, 22, and 23 indicate mean subjective responses to varying rms levels of vertical acceleration with constant rms transverse accelerations. Figure 26 shows a typical power spectral density plot for each of the three flights. The actual frequency bands achieved (determined by half-power points) were 0.2 to 1.0 Hz, 0 to 0.65 Hz, and 0.4 to 1.2 Hz with peak power points at approximately 0.5, 0.35, and 0.8 Hz, respectively. As these data were mainly for comparison with future ground-based simulations, no analysis is presented here; however, for the first two bandpass frequencies similar results to the atmospheric spectrum were obtained.

CONCLUSIONS

- Use of airborne simulators can provide important baseline data to confirm or negate ground-based simulator validity. Scheduling problems and cost of airborne investigation will necessarily limit its use to spot checking validity of ground-reproducible regimes, and efficiently planned programs examining regimes not reproducible on ground-based simulators.
- The TIFS system is useful for sinusoidal testing in vertical, transverse, and roll degrees of freedom, has some important limitations in random vertical and transverse accelerations, and is severely restrictive in random roll and yaw rate investigations.
- The TIFS aircraft did permit the University of Virginia to explore isolated degrees of freedom and motion combinations unavailable in commercial flight experiences. Useful data

were obtained which can be applied to the modeling effort currently in progress.

- Unless naiveté is deemed essential, subjects should be screened on ground-based simulators to prevent use of unreliable subjects for flight testing and provide a training situation to confirm the subject's understanding of the judgments (responses) he or she is asked to make.

RECOMMENDATIONS

- Improved temperature control for motion experiments.
- Investigation of temperature and humidity as independent variable constituents of subjective response to ride quality. The nature and variety of motion variables investigated in these tests precluded controlled experiments with temperature as the subject variable.
- Increasing confidence in results by repeated experiments to achieve a reasonable statistical sample. The time limitations of this program restricted repetition of flight tests.
- Examine effects of visual cues on responses.
- Examine effects of activity (reading, conversation, looking out window, etc.) on responses.
- Examine effects of motion on performance of normal passenger activities.
- Investigate subject response degradation with exposure time and flight test frequency (i.e., recovery time and fatigue effects).
- Provide onboard (computer) calculation of rms motion values for segments to permit more efficient use of flight test time available.

- Examine the effect of subject group composition on mean subjective response using existing data.
- Run additional tests (perhaps on ground-based simulators) to further investigate the effects of interchanging the constant and variable presentation of motion inputs: e.g., in tests similar to Flights 325, 353, and 359 present varying levels of vertical acceleration in conjunction with constant levels of transverse acceleration to determine whether or not the method of presentation affects subject response sensitivities.

REFERENCE

1. Schoonover, W. E., Jr.: Protocol: In-Flight Simulator Investigation of Passenger Subjective Response to Vehicle Motions. NASA Langley Research Center, April 1974. (Unpublished material; available from author.)

SUBJECT RESPONSE SHEET

1. Very Comfortable
2. Comfortable
3. Somewhat Comfortable
4. Neutral
5. Somewhat Uncomfortable
6. Uncomfortable
7. Very Uncomfortable

Name:_____

Date:_____

Flight (circle): 1 2

Seat:_____

How do you feel?

Did you do or eat anything today which is quite different from your normal routine?

PLEASE REMEMBER: Your response should indicate your OVERALL COMFORT LEVEL. YOU ARE NOT TO MEASURE ONLY THE MOTION. We need to know how you feel Make comments freely. Your responses are confidential.

Segment	Overall Subjective Response	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Figure 1.- Sample subject response sheet.

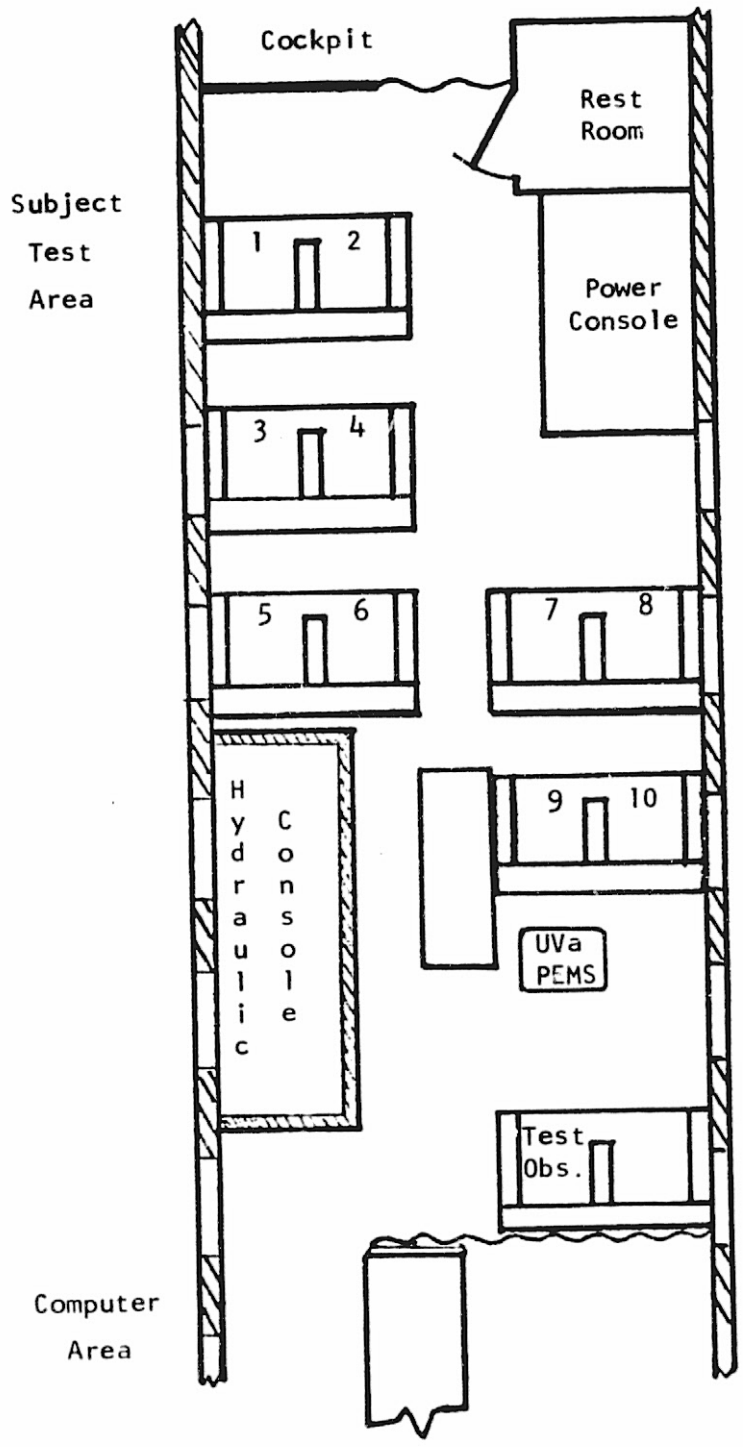
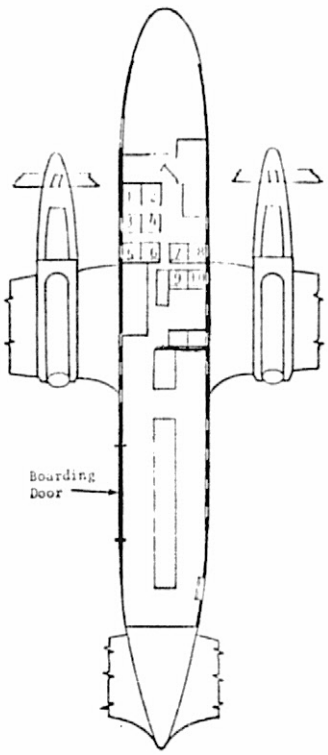


Figure 2.- TIFS subject test area arrangement.



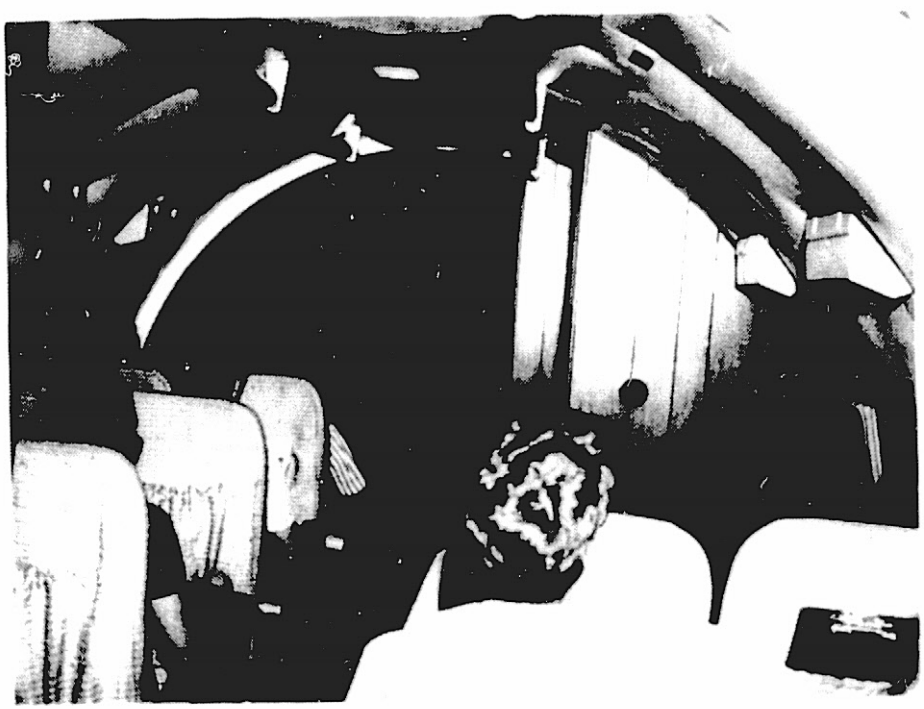
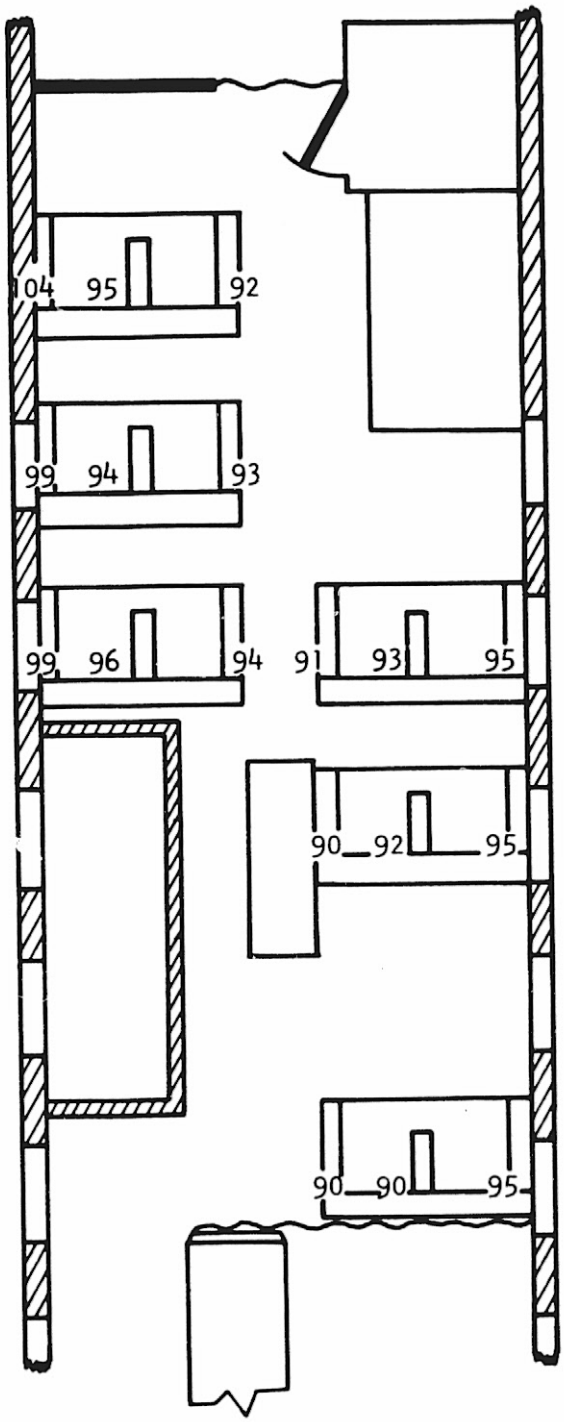


Figure 3.- TIFS cabin arrangement.



dB(A) Slow

Type S3A
Sound Level Meter

FIGURE 4. SOUND PRESSURE LEVEL DISTRIBUTION

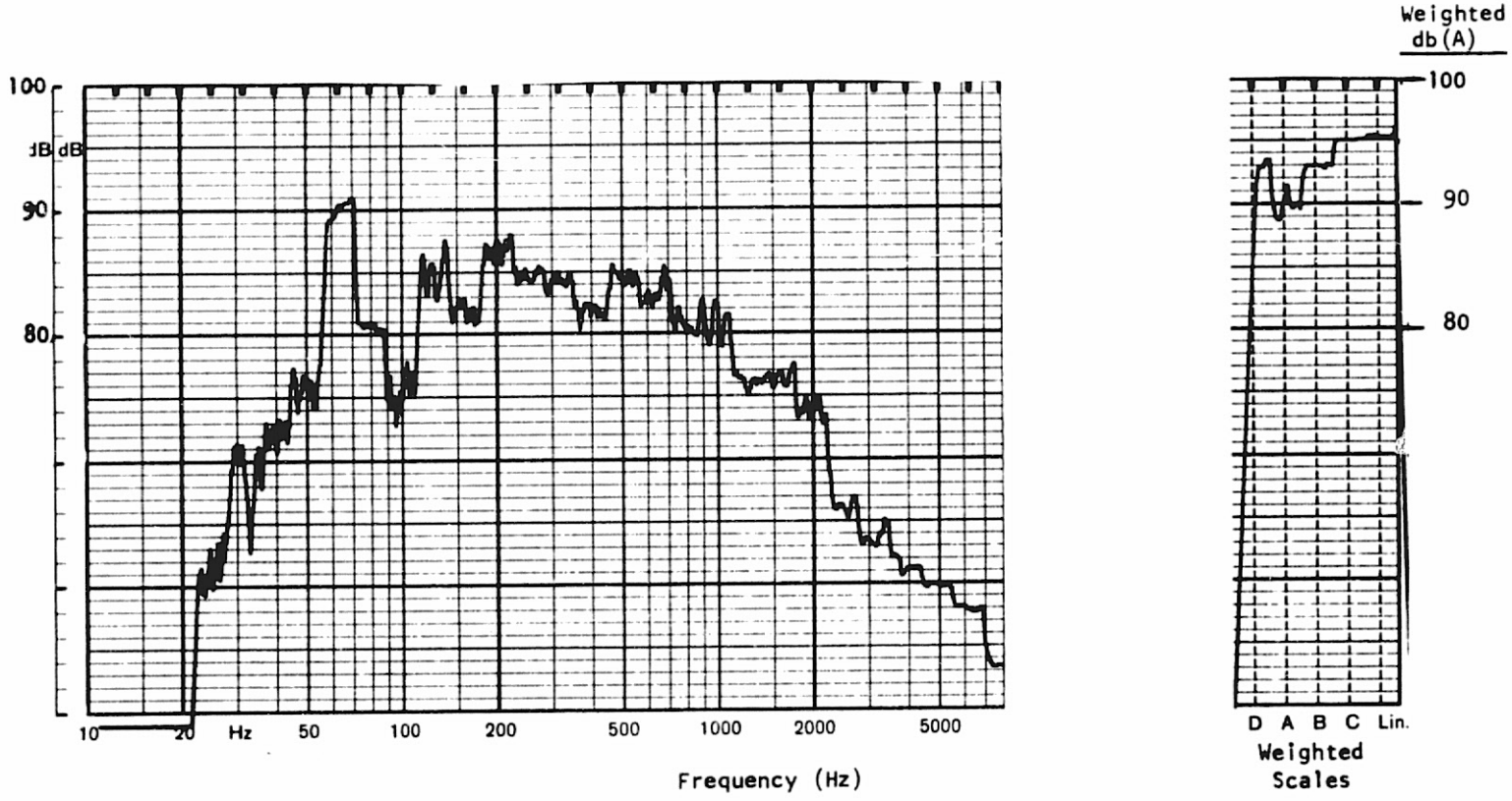


Figure 5.- Typical TIFS noise spectrum recorded by PEMS II.

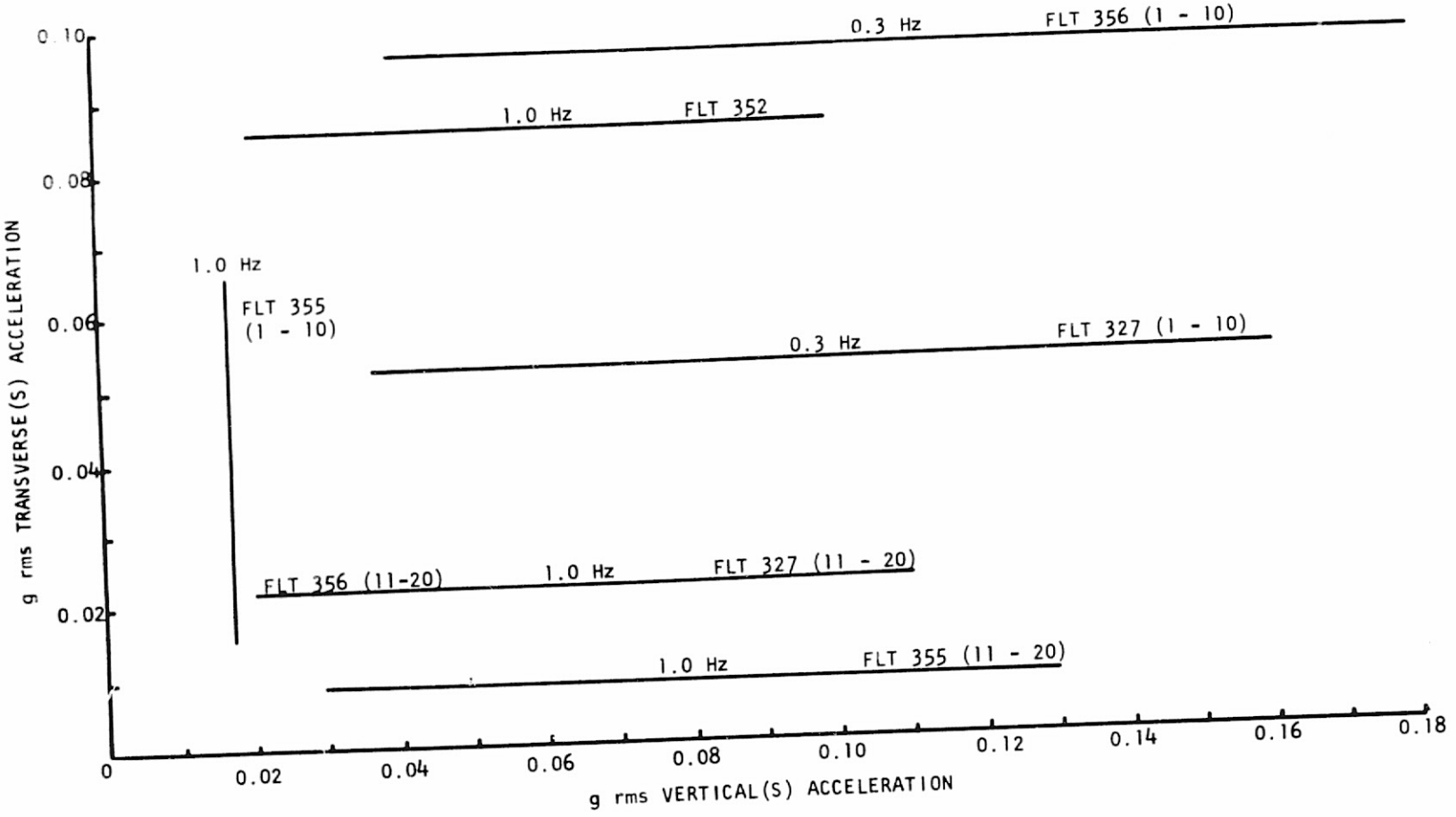


Figure 6.- Sinusoidal motions range, transverse vs. vertical with frequency, flight number, and (flight segments) indicated.

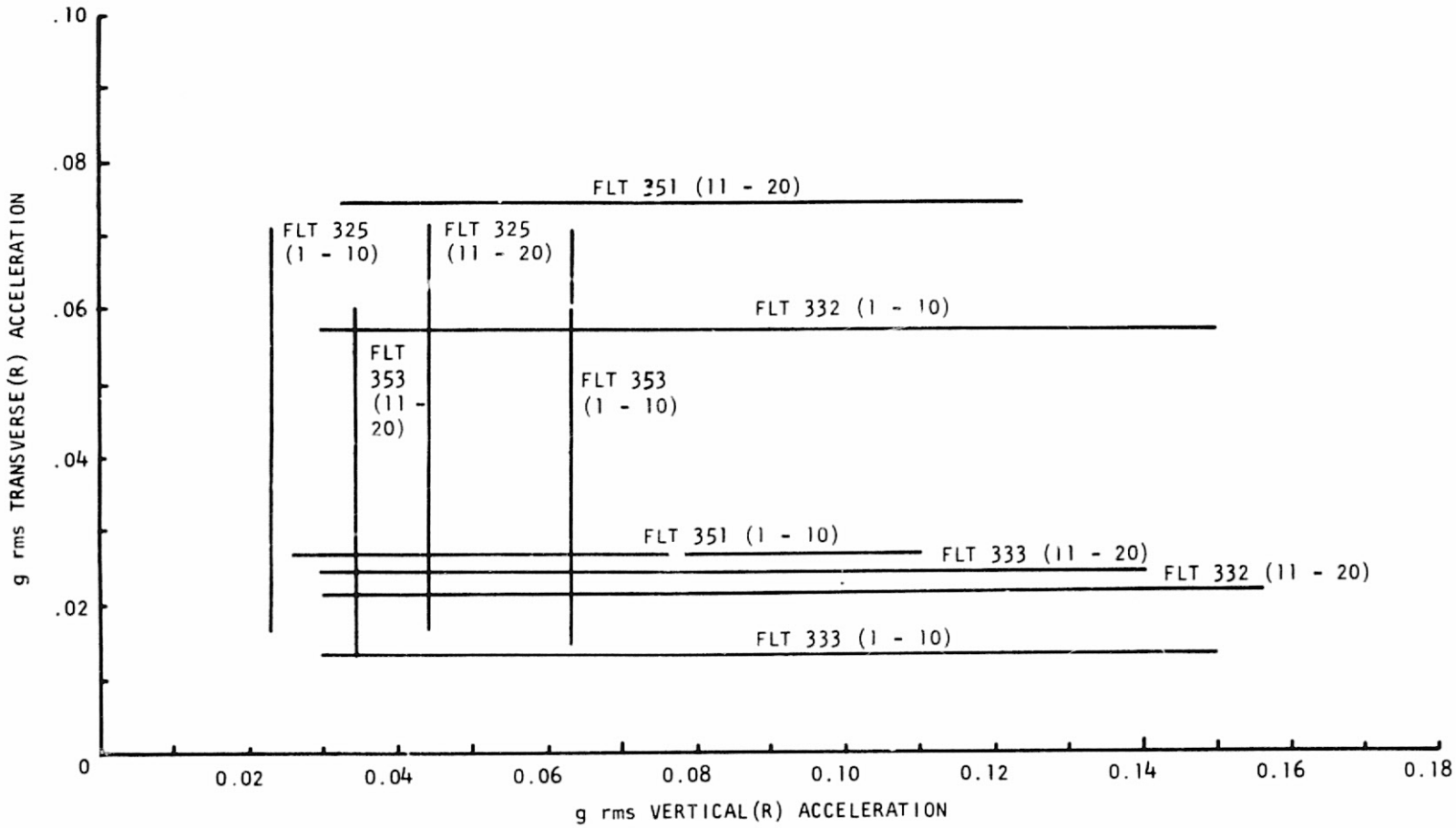
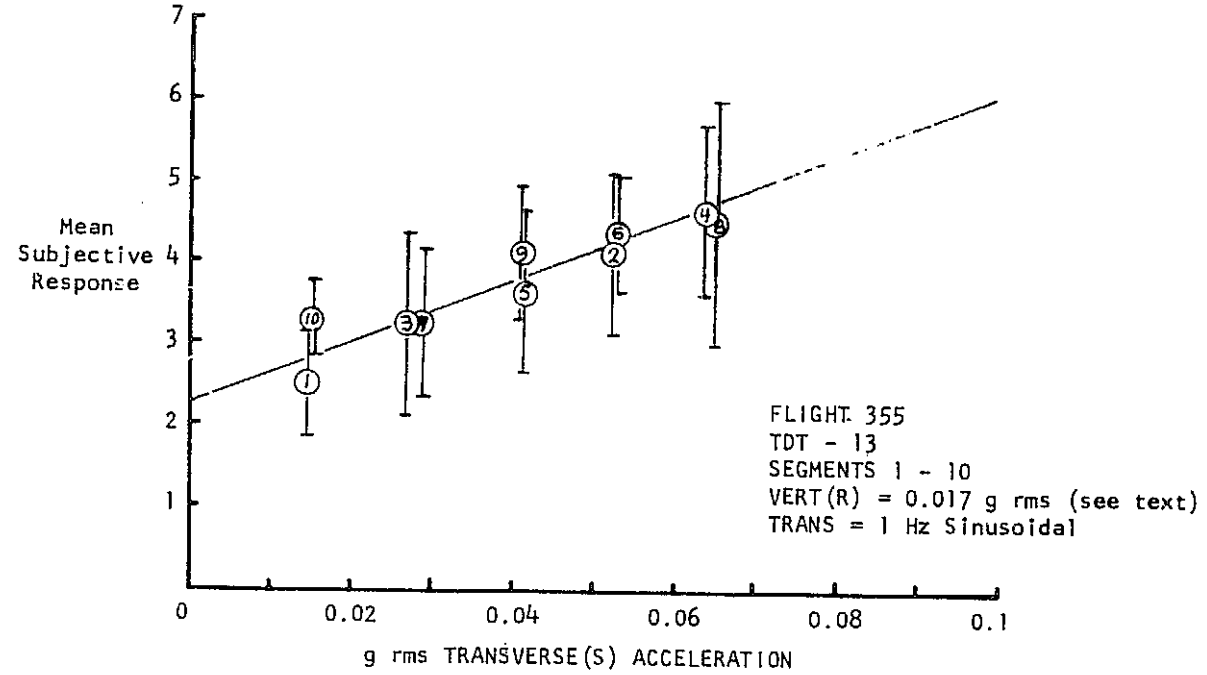


Figure 7.- Random motions range, transverse vs. vertical with flight number and (flight segments) indicated.



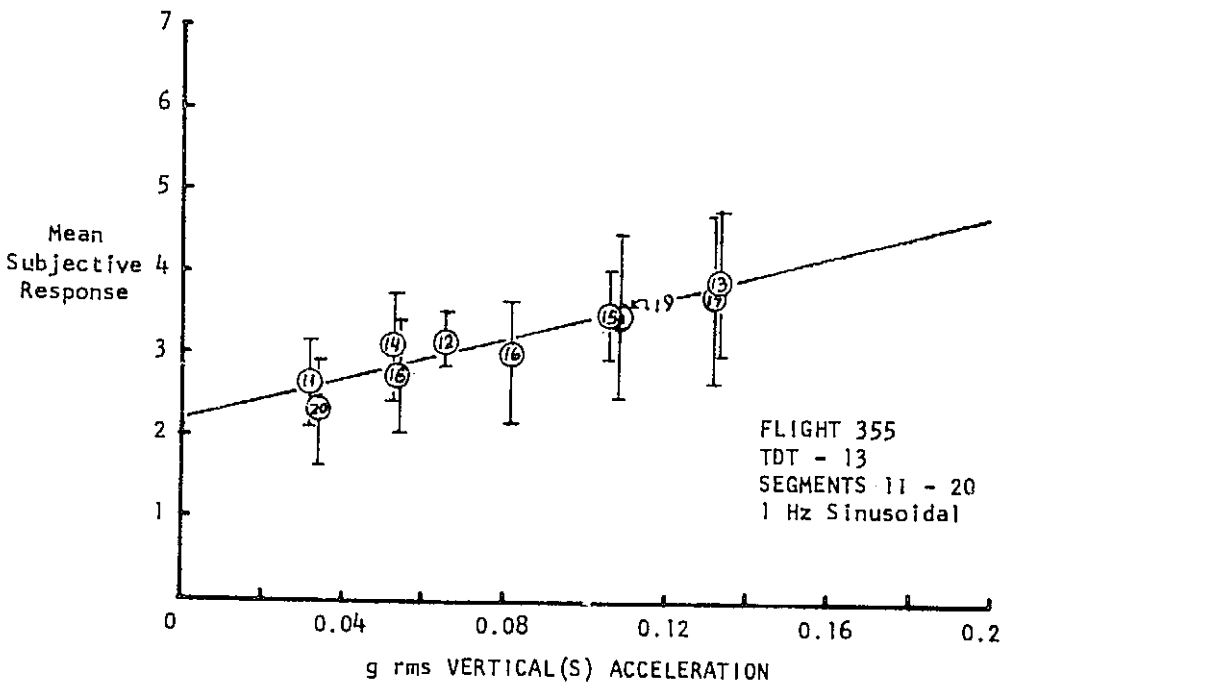


Figure 8.- Sinusoidal transverse and vertical accelerations, Flight 355.

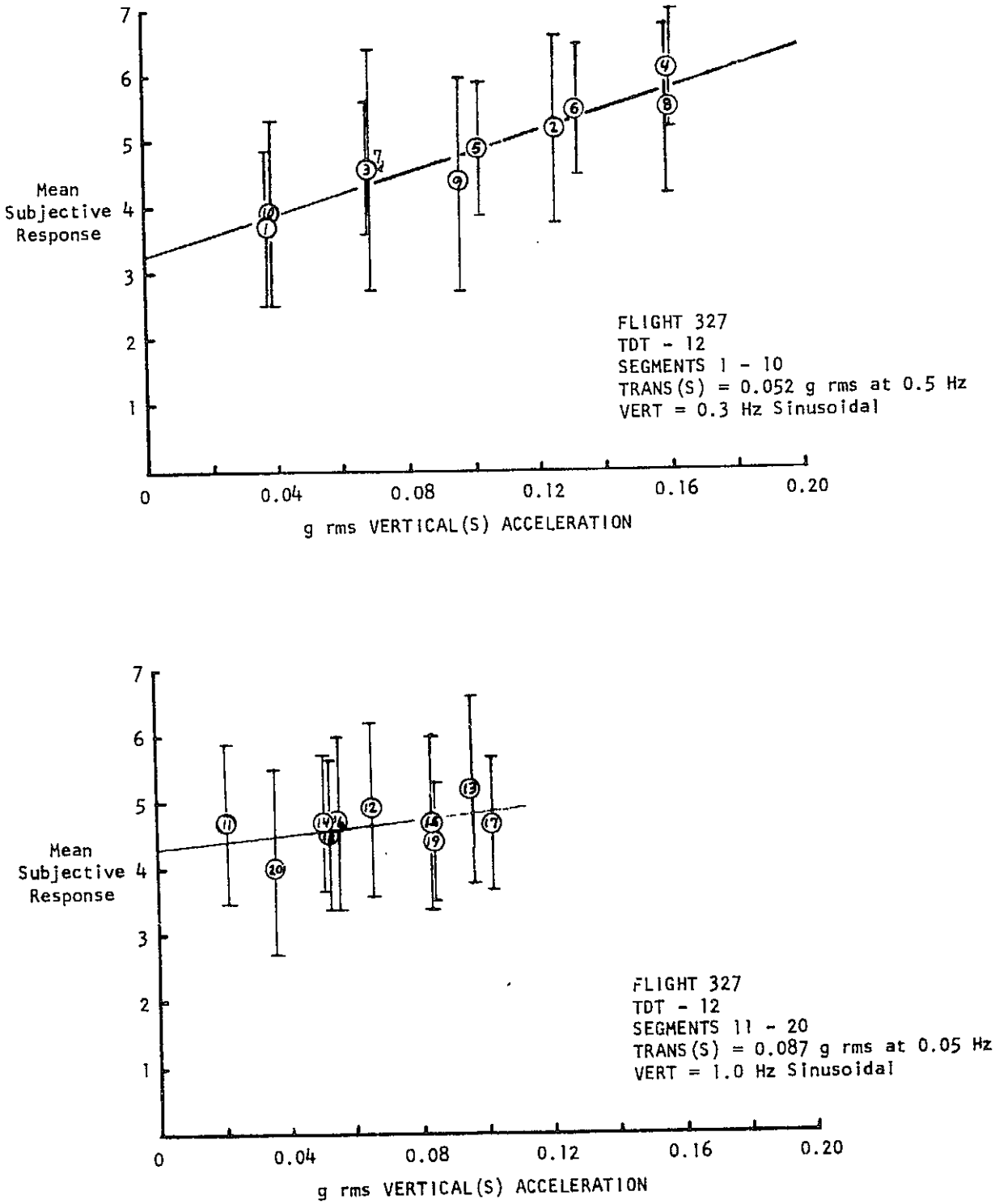


Figure 9.- Sinusoidal vertical and transverse accelerations, Flight 327.

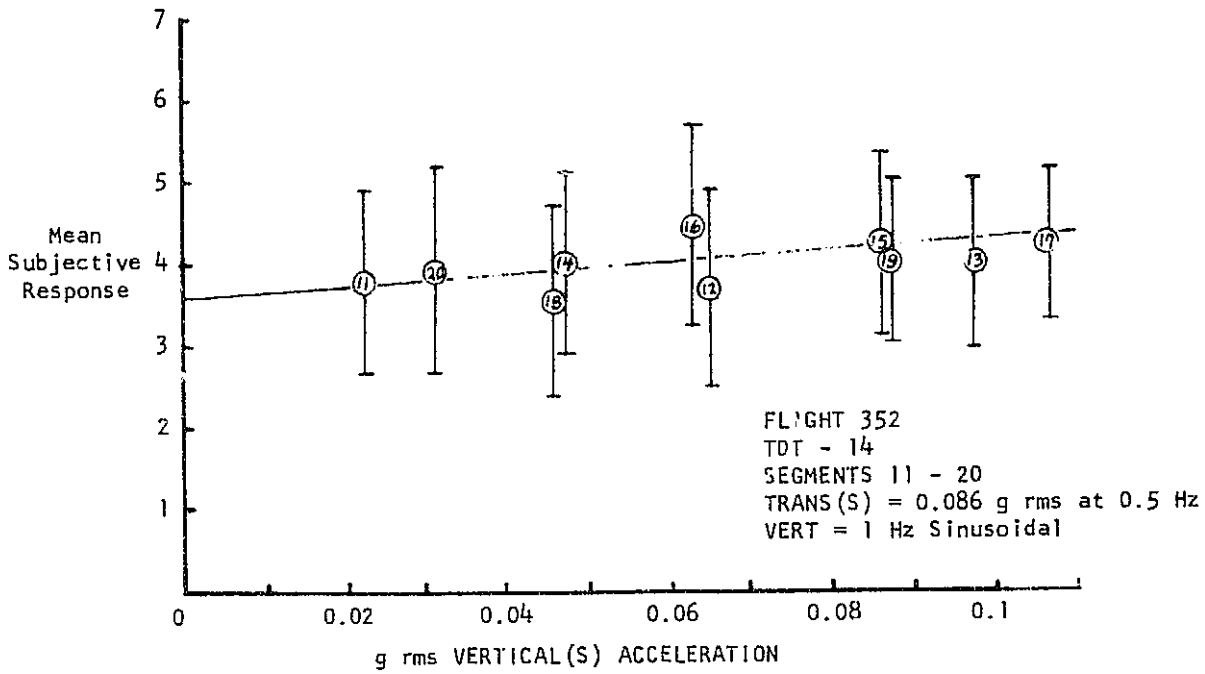
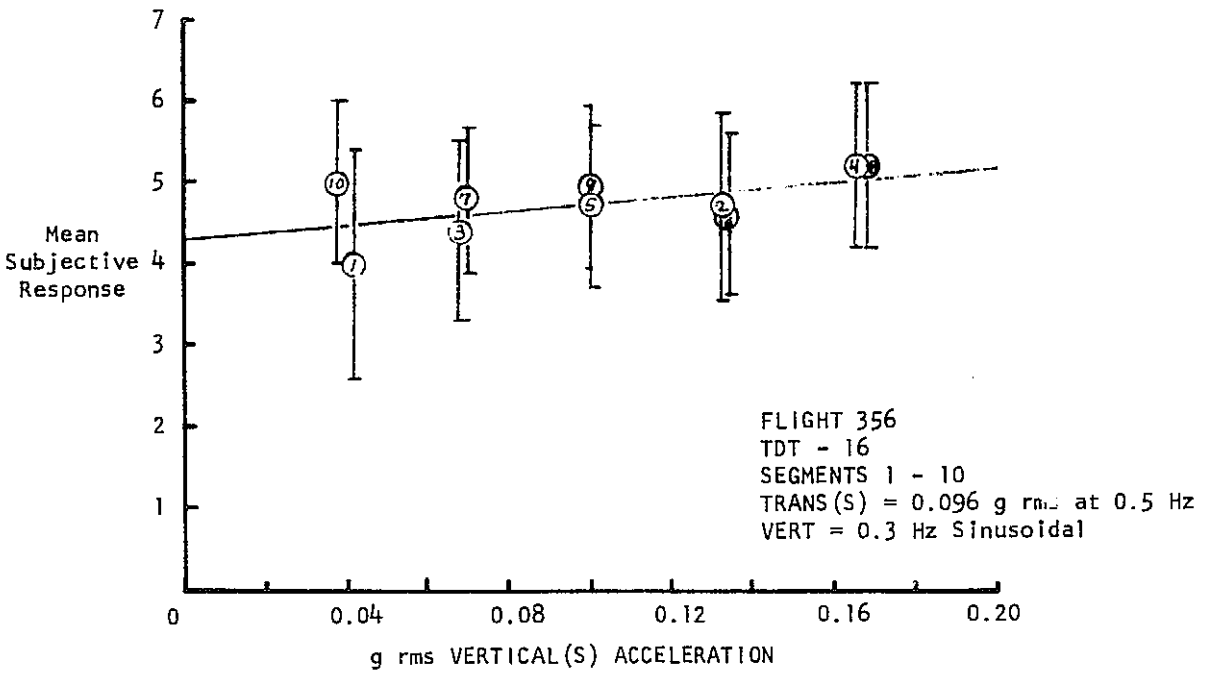


Figure 10.- Sinusoidal vertical and transverse accelerations, Flight 352.



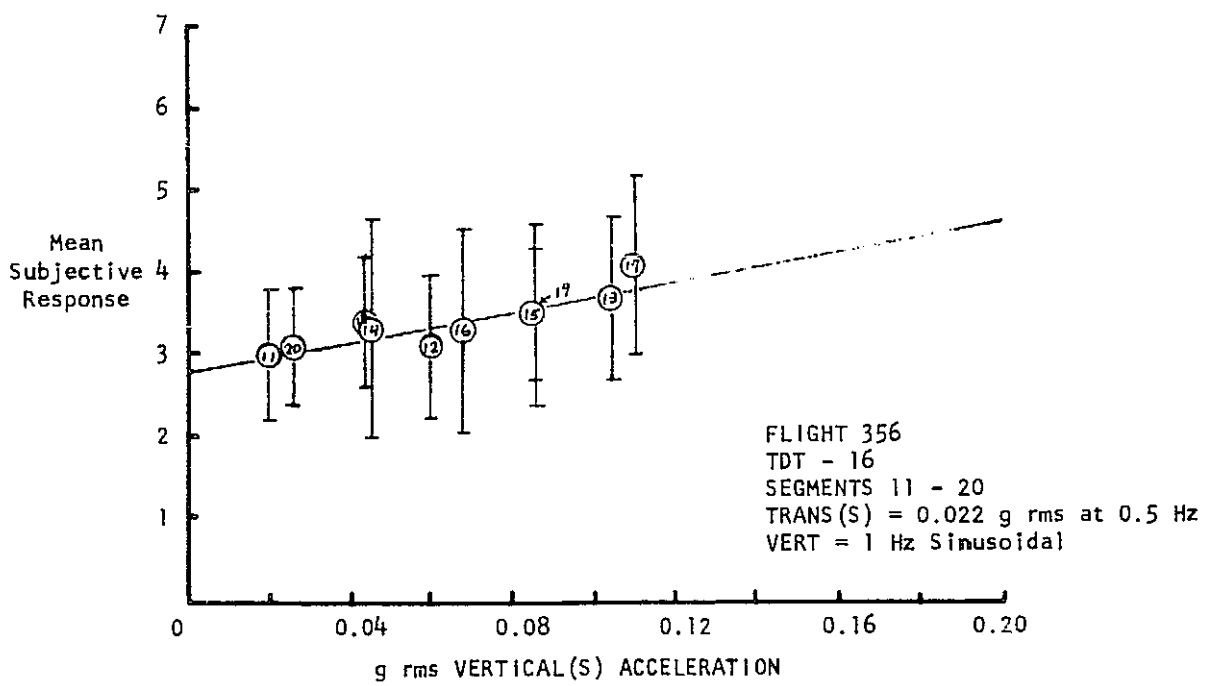


Figure 11.- Sinusoidal vertical and transverse accelerations, Flight 356.

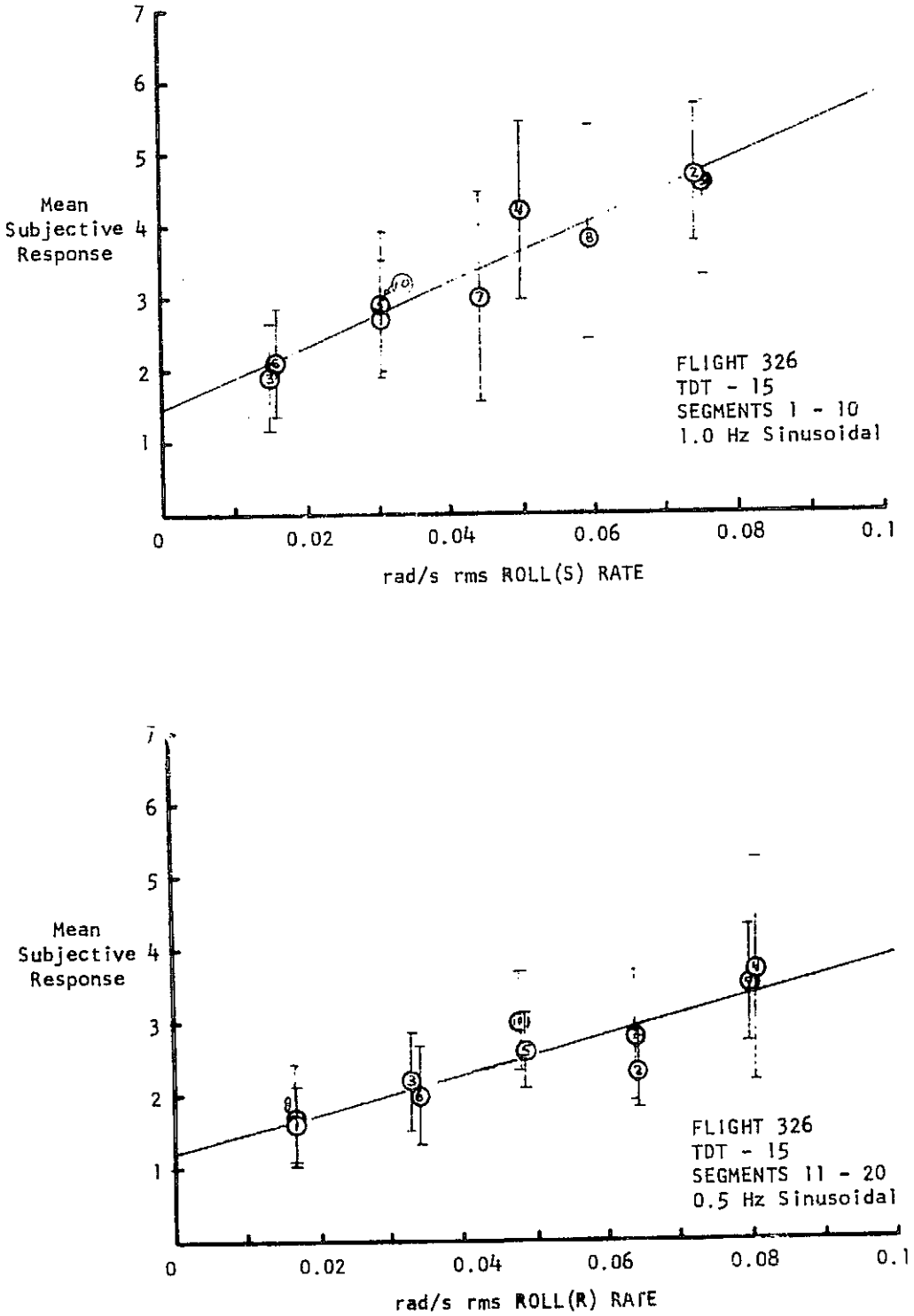


Figure 12.- Sinusoidal roll rate, Flight 326.

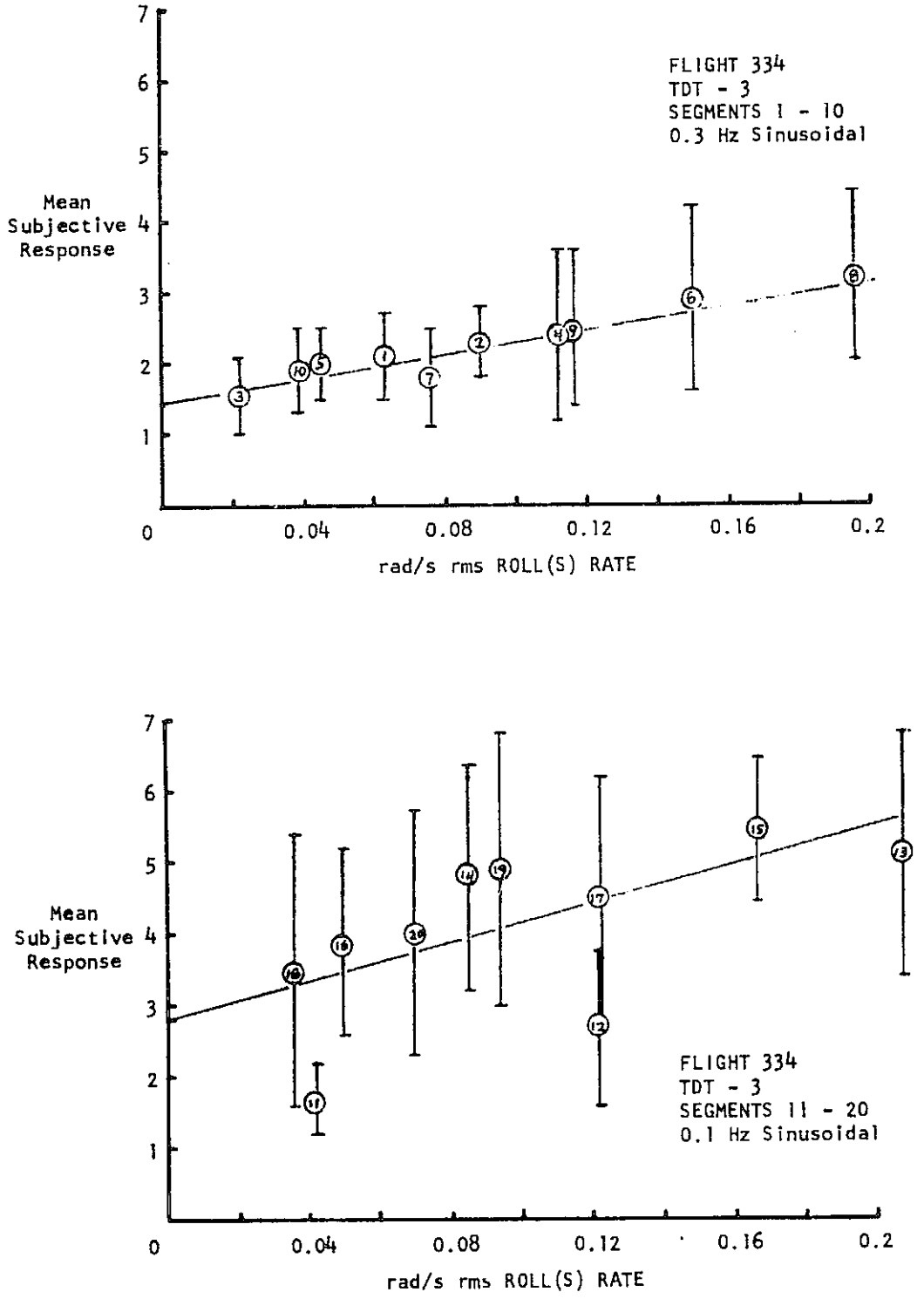


Figure 13.- Sinusoidal roll rate, Flight 334.

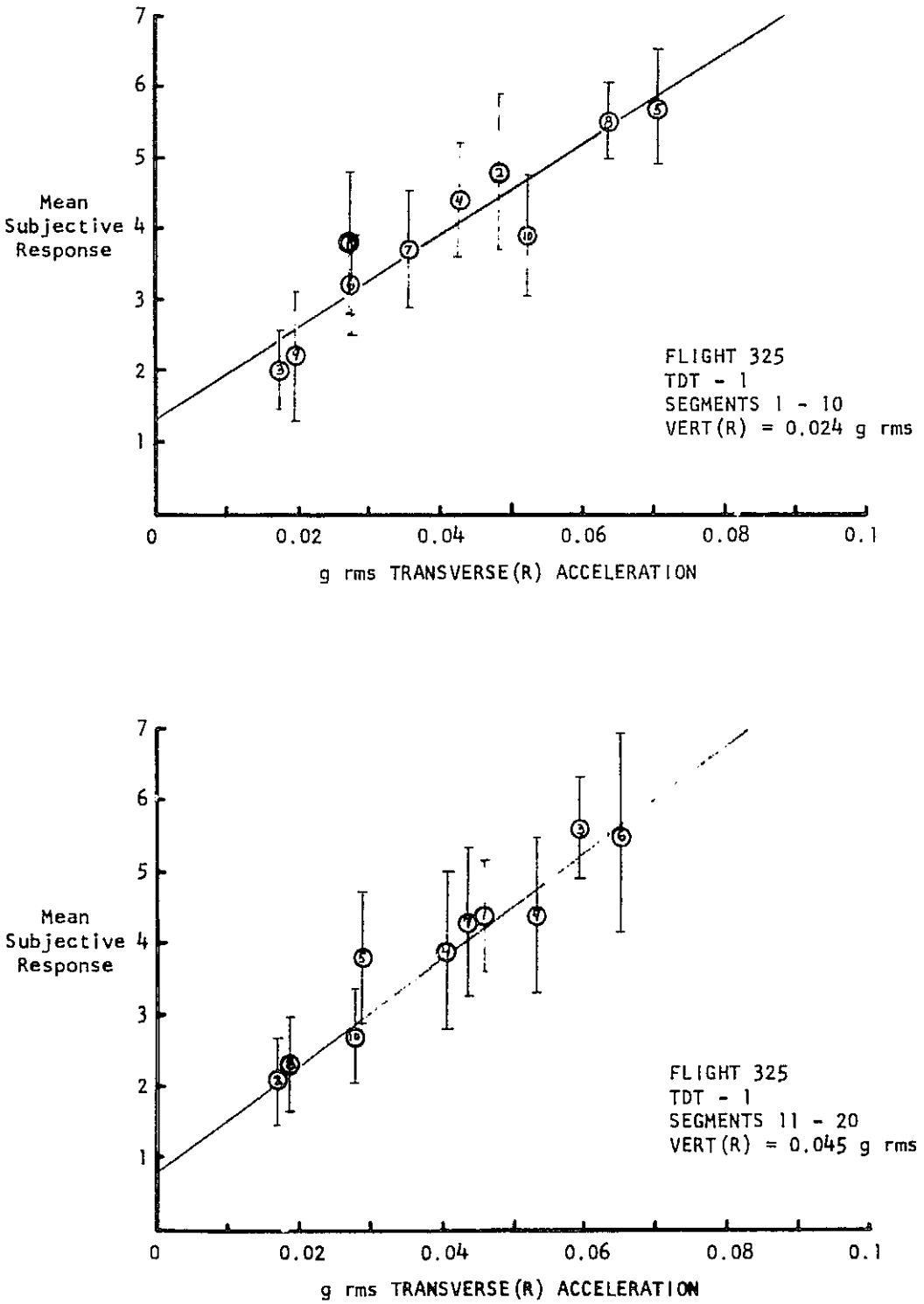
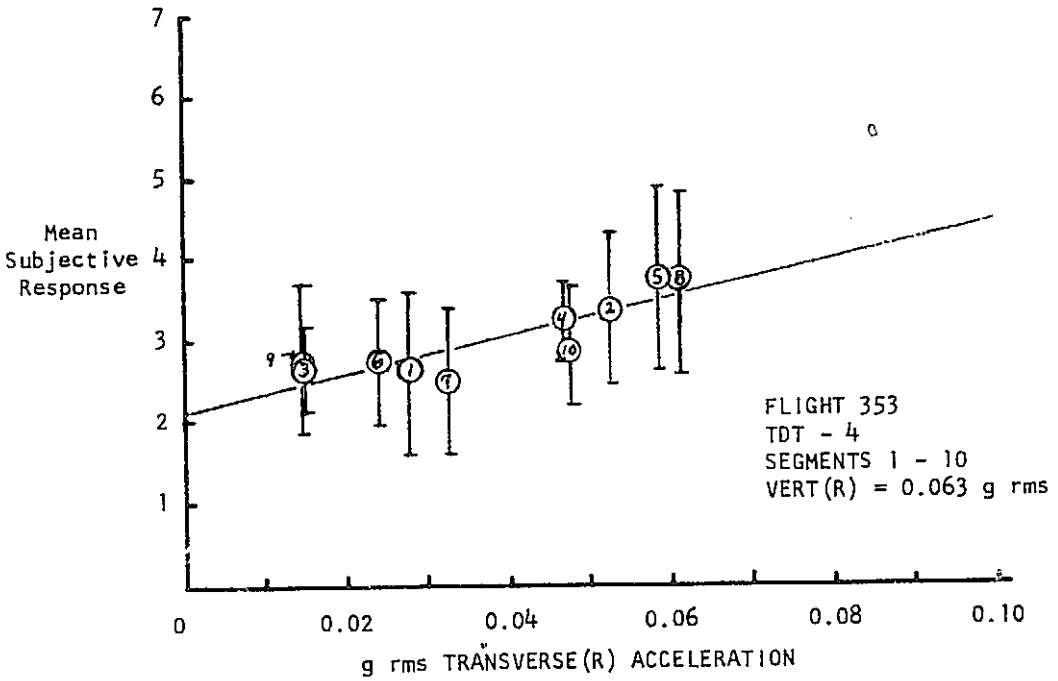


Figure 14.- Random transverse and vertical accelerations, Flight 325.



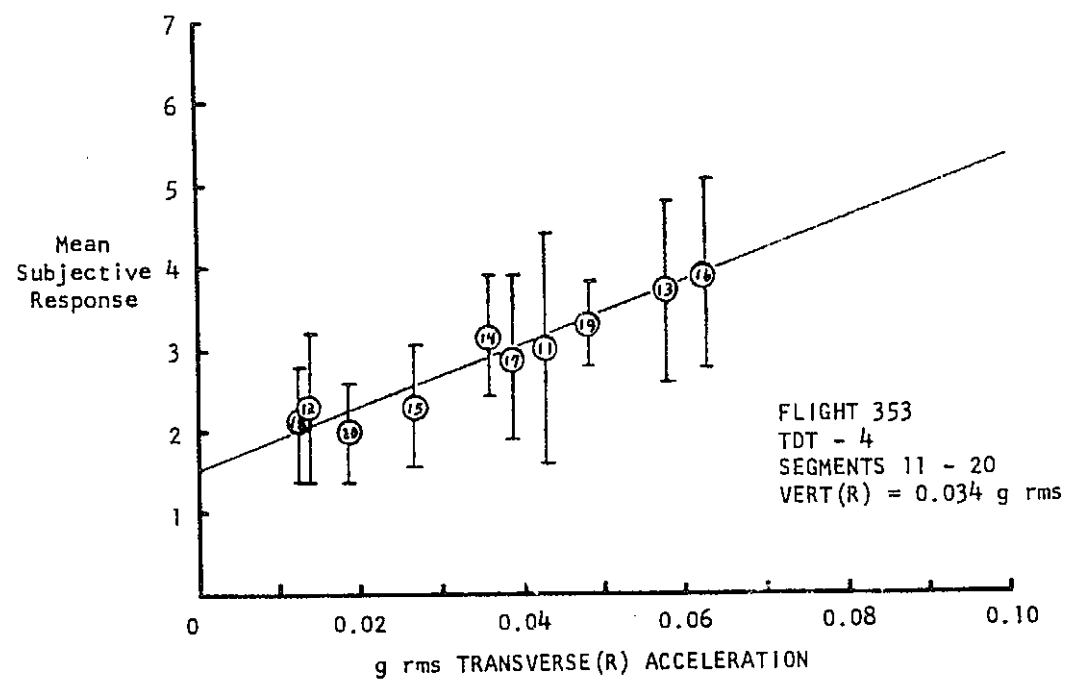


Figure 15.- Random transverse and vertical accelerations, Flight 353.

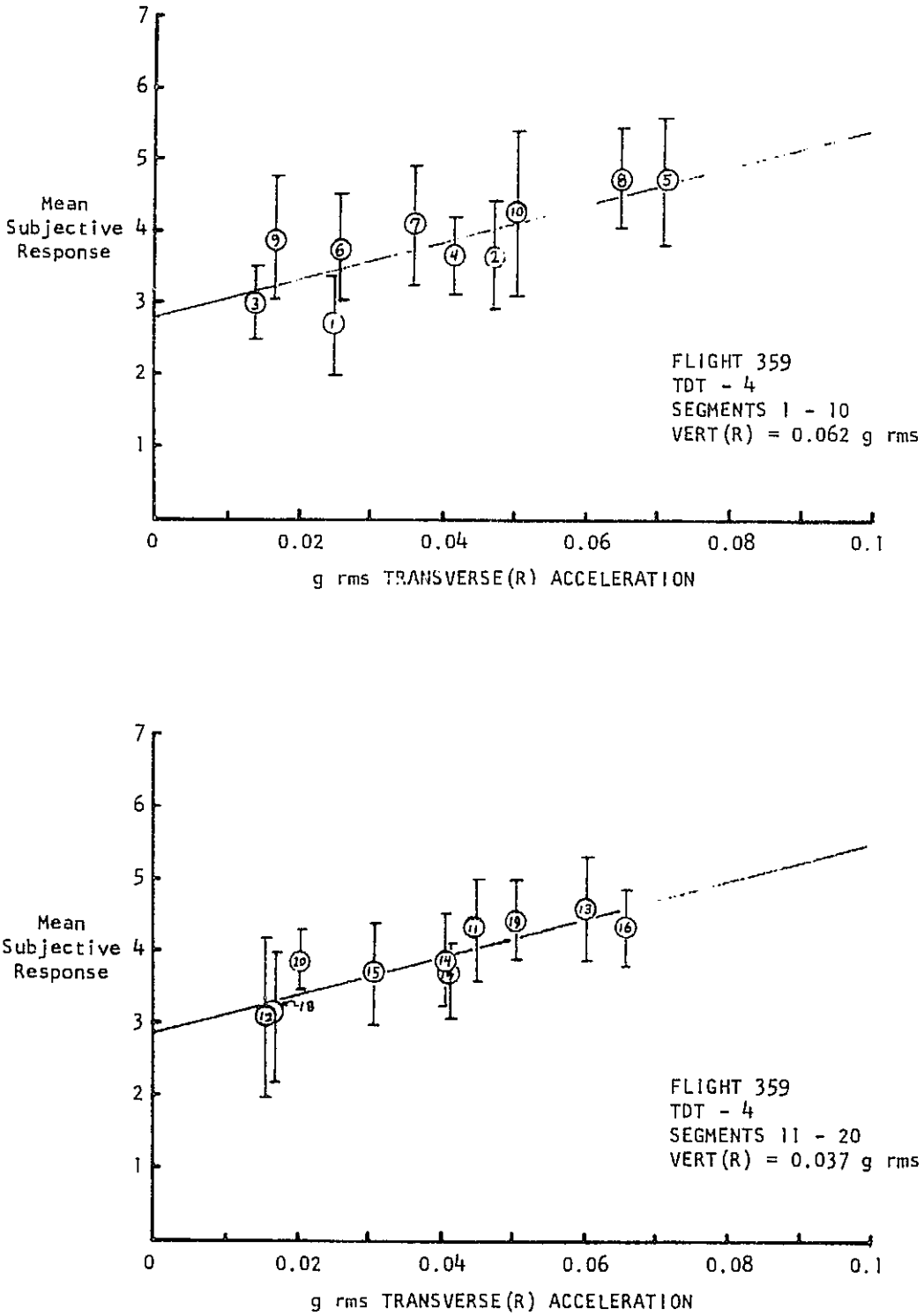


Figure 16.- Random transverse and vertical accelerations, Flight 359.

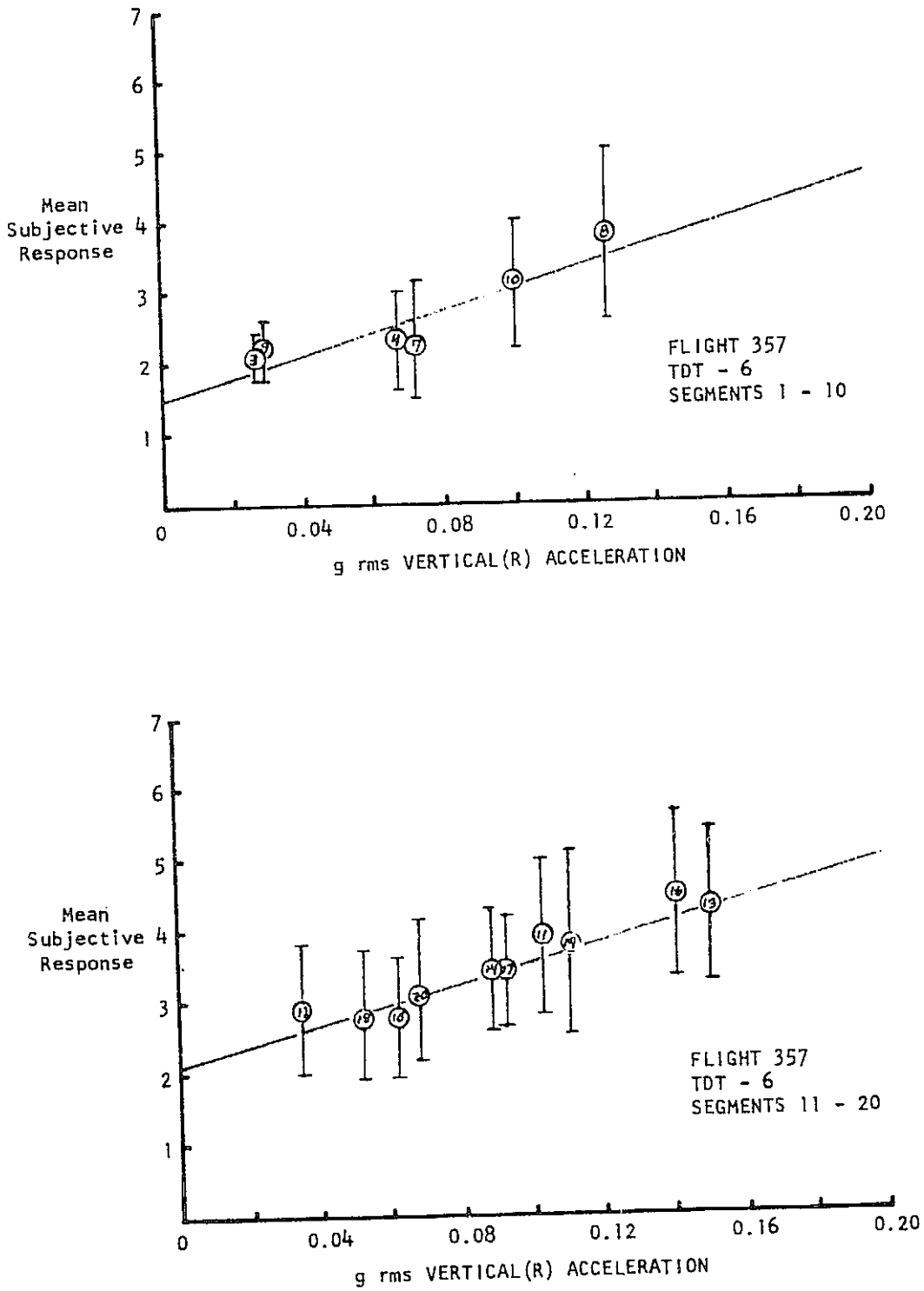


Figure 17.- Random vertical acceleration, Flight 357.

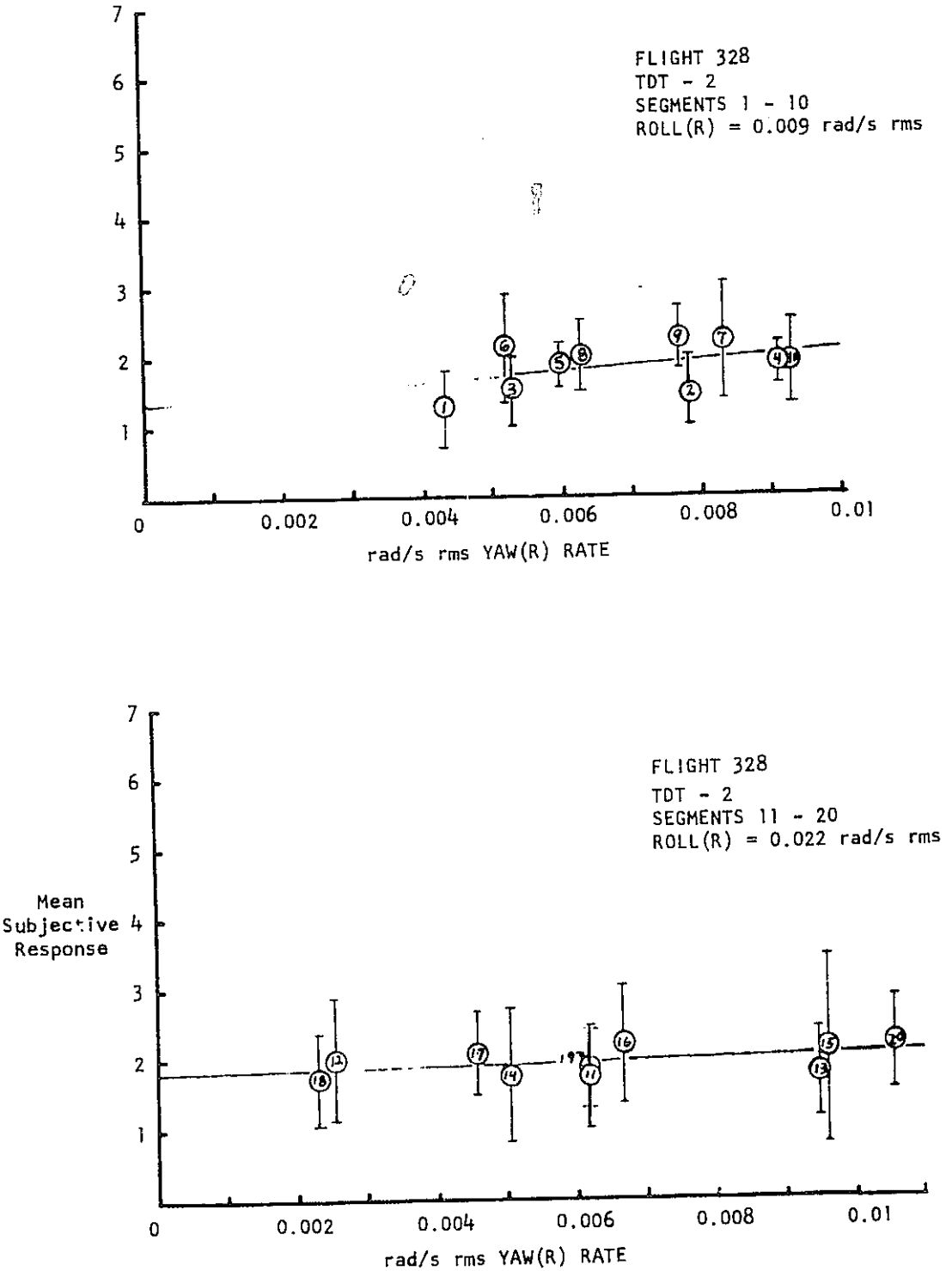
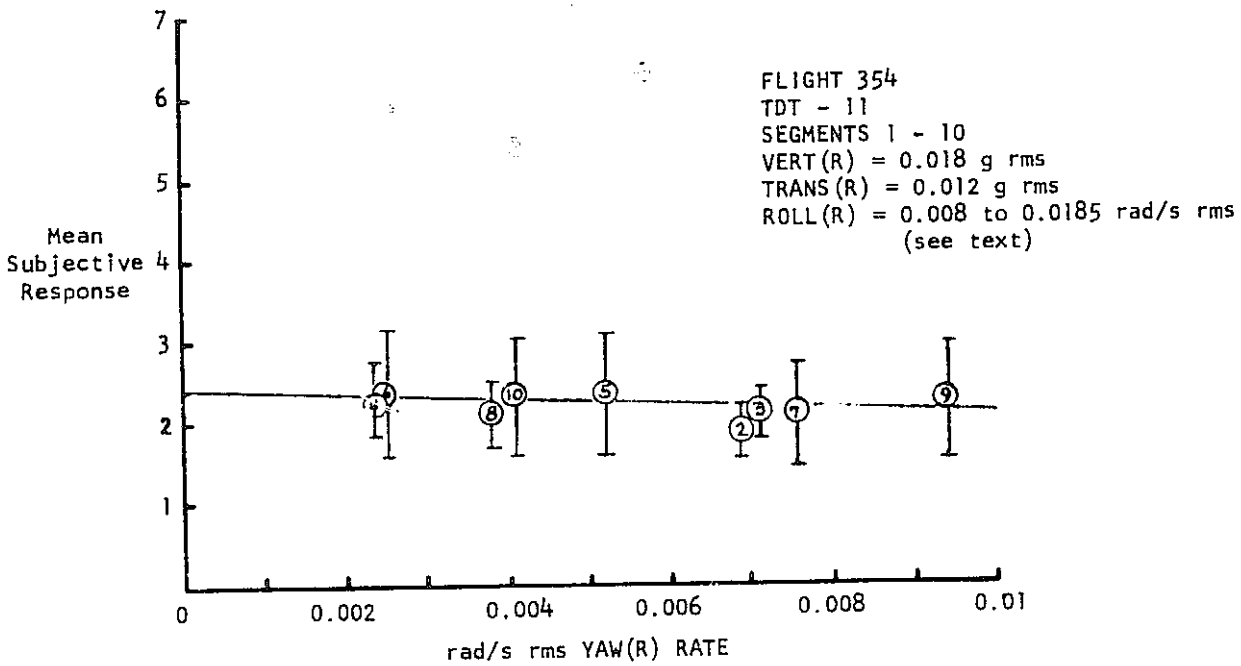


Figure 18.- Random yaw and roll rates, Flight 328.



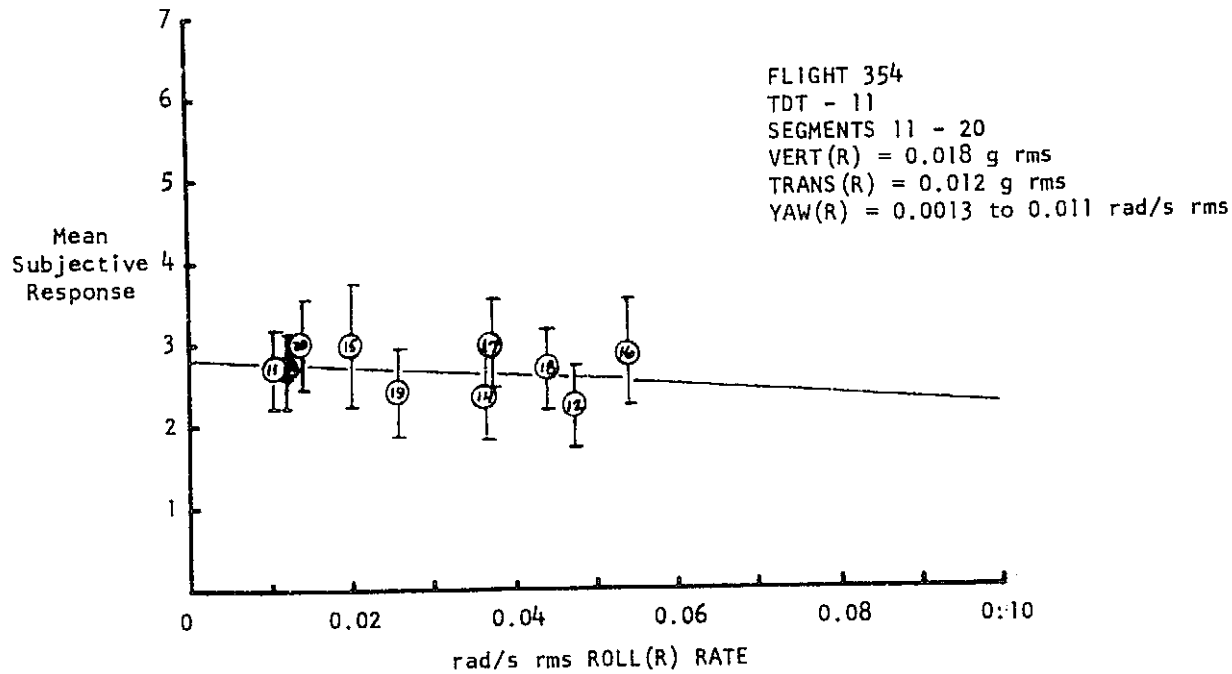


Figure 19.- Random yaw and roll rates with background random vertical and transverse accelerations, Flight 354.

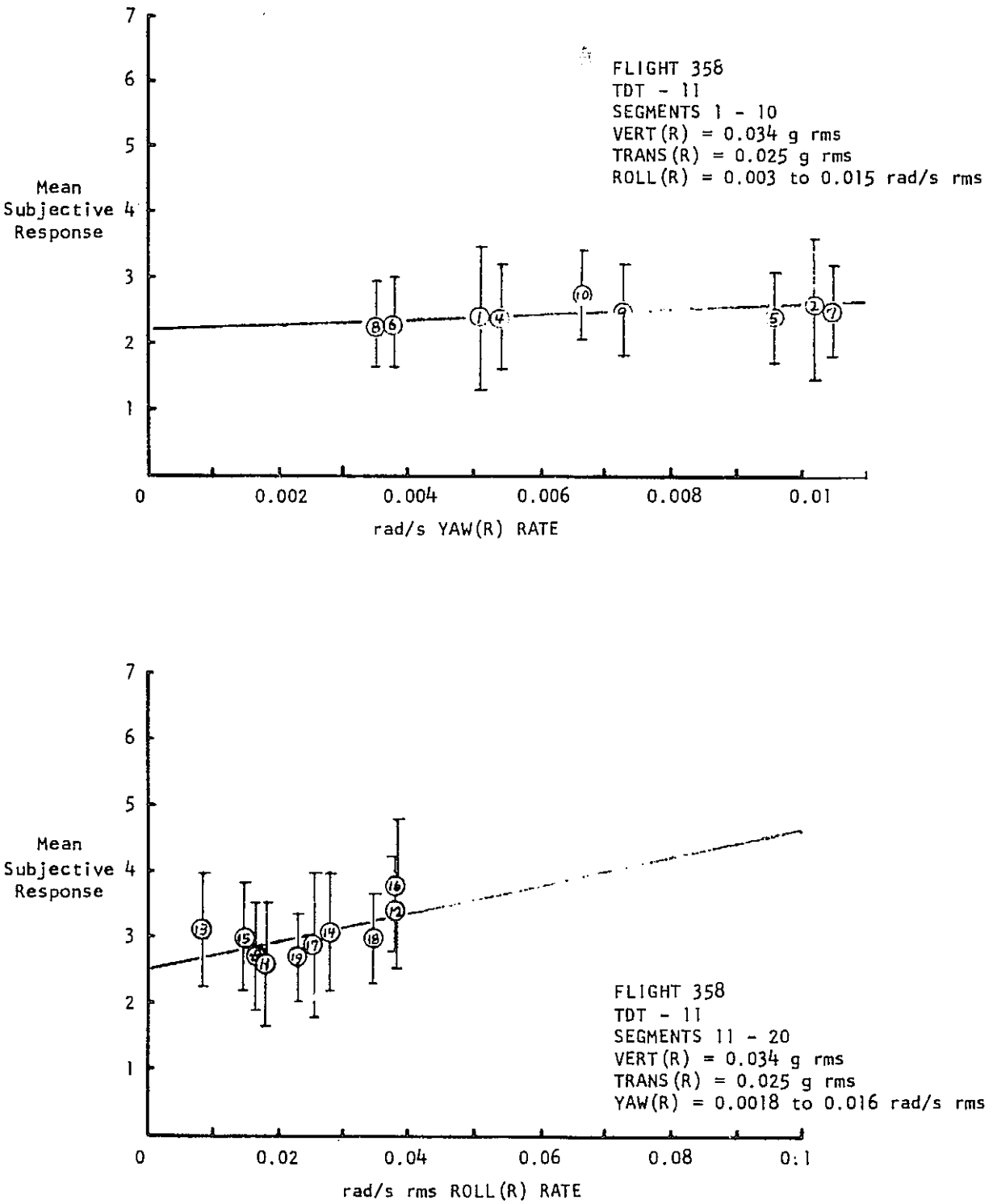
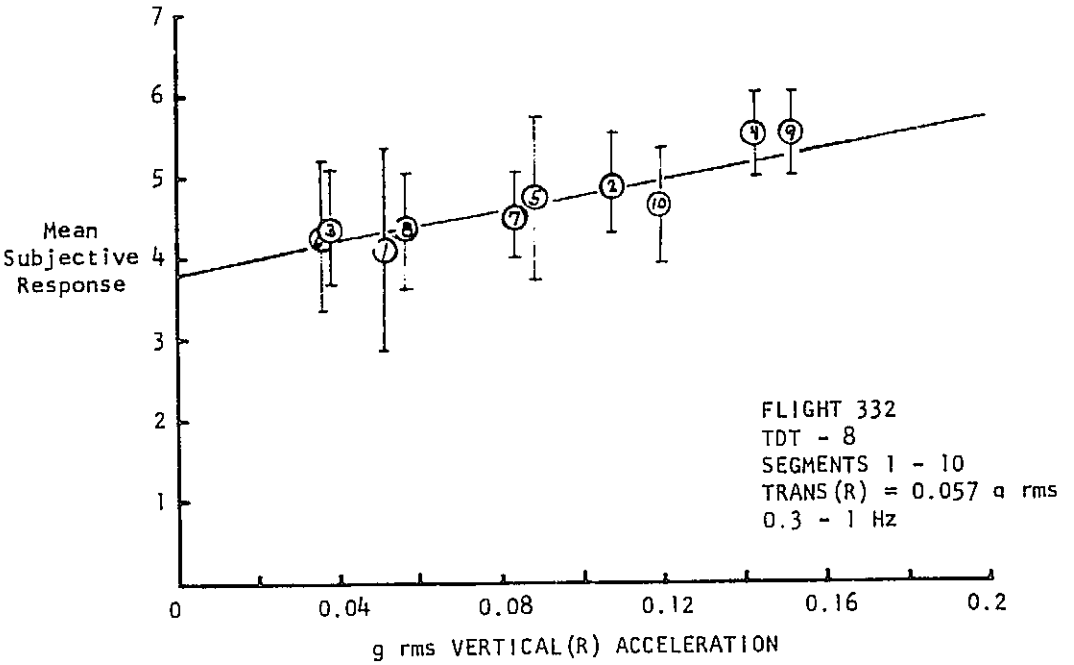


Figure 20.- Random yaw and roll rates with background random vertical and transverse accelerations, Flight 358.



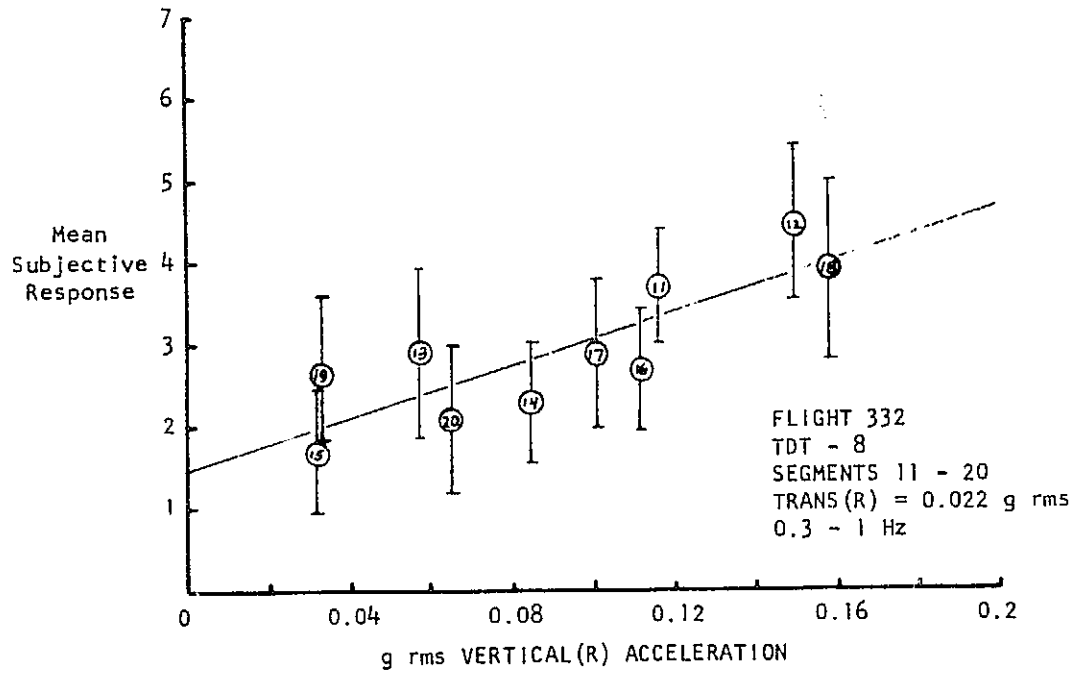
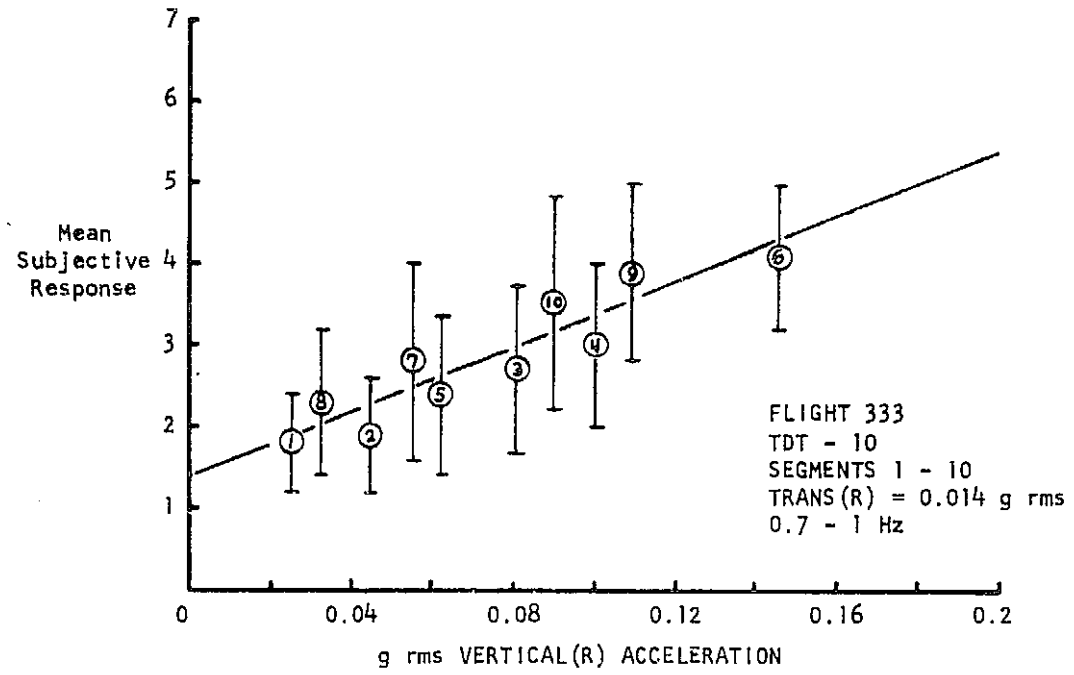


Figure 21.- Random vertical and transverse accelerations, 0.3 - 1 Hz, Flight 332.



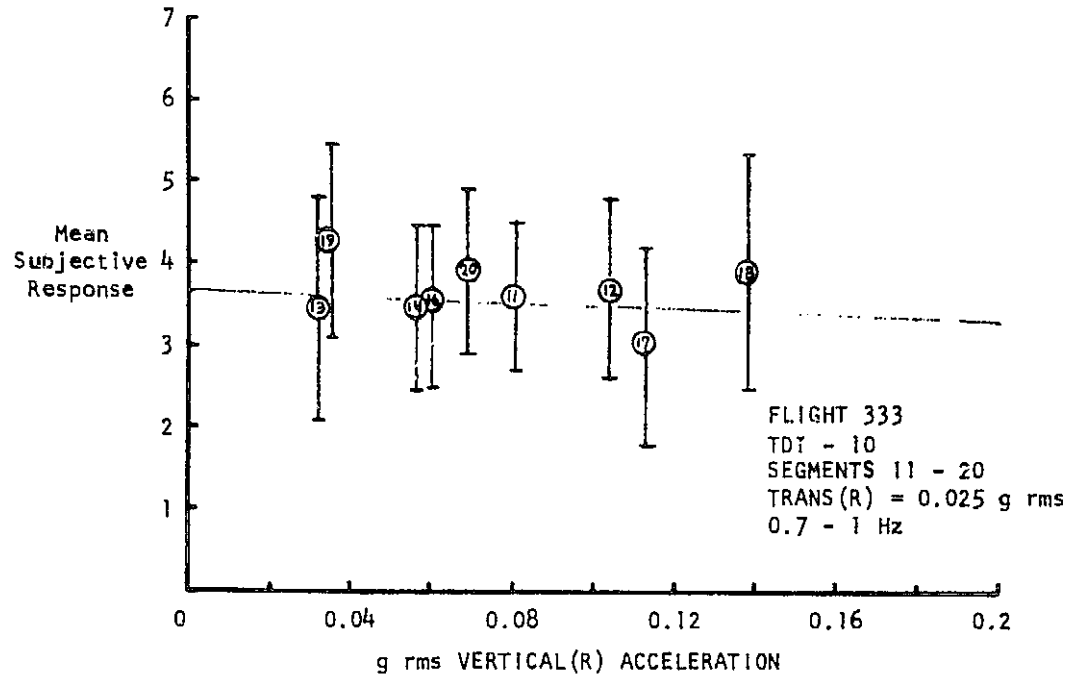


Figure 22.- Random vertical and transverse accelerations, 0.7 - 1 Hz, Flight 333.

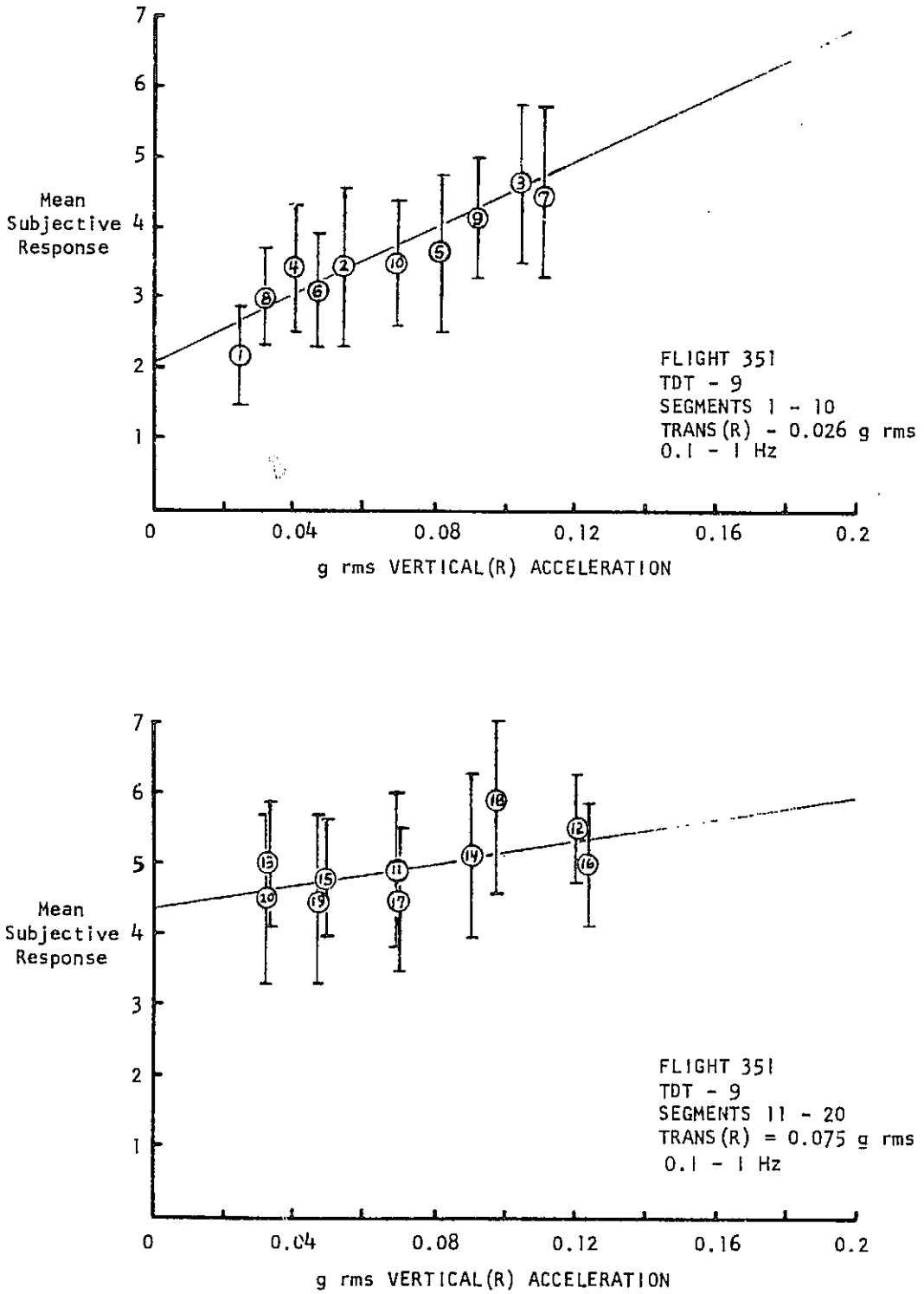


Figure 23.- Random vertical and transverse accelerations, 0.1 - 1 Hz, Flight 351.

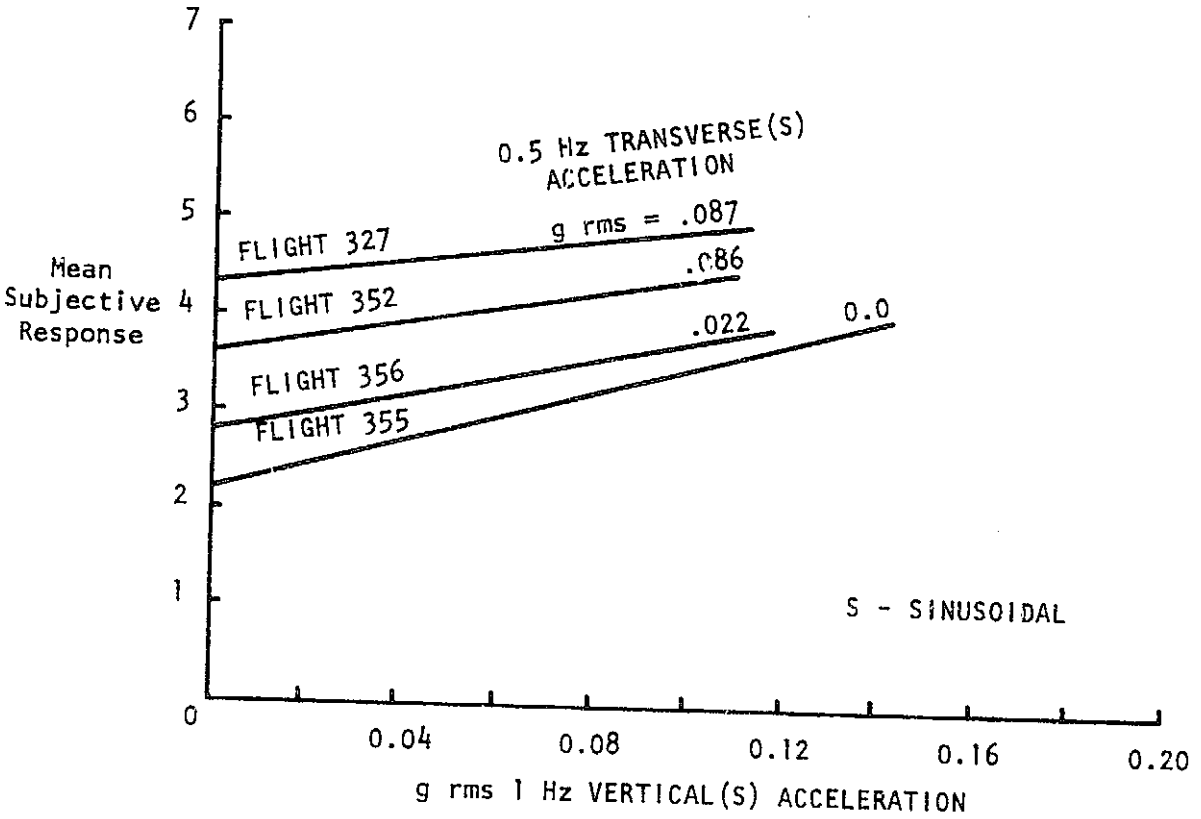


Figure 24.- Vertical and transverse sinusoidal accelerations, Flights 327, 352, 356, and 355.

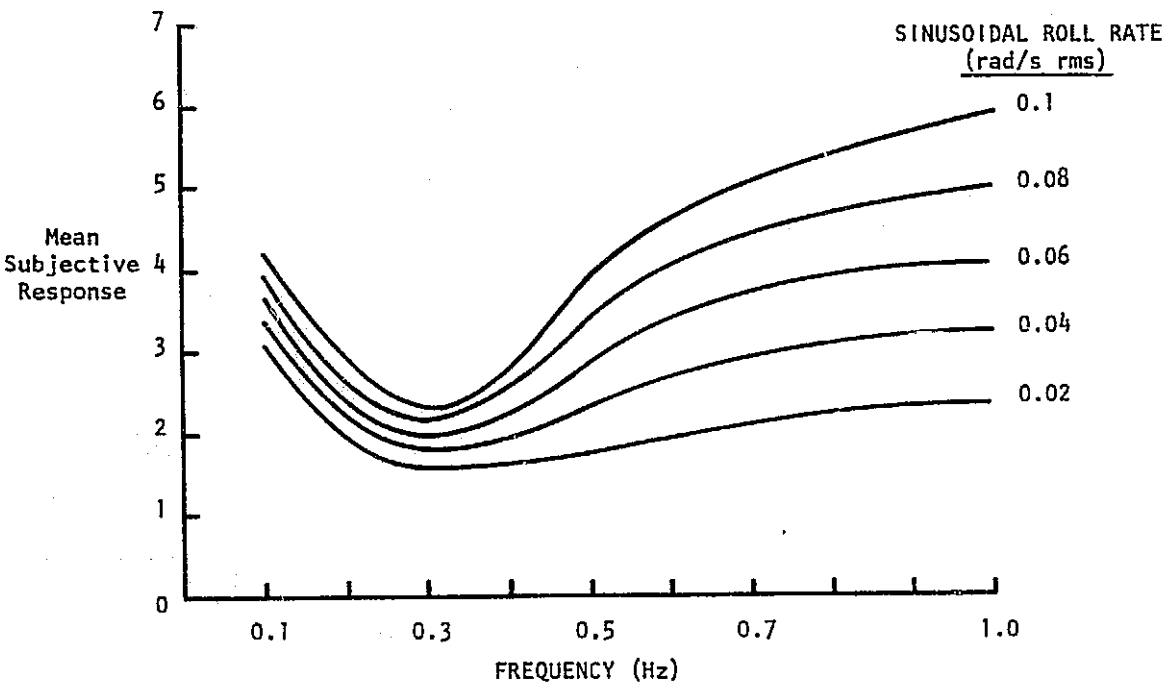


Figure 25.- Comfort response vs. frequency of sinusoidal roll rate.

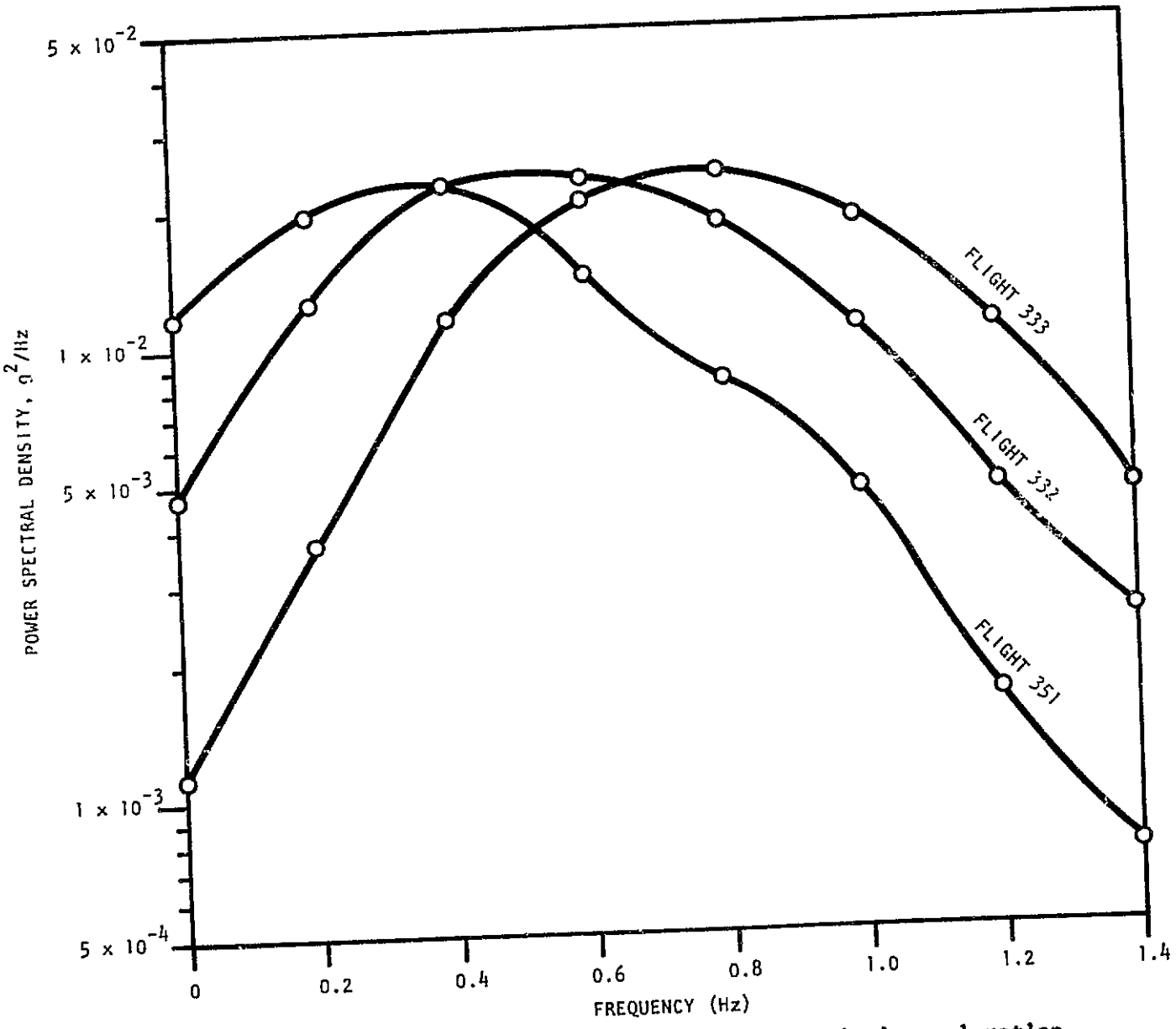


Figure 26.- Typical power spectral density plots of vertical acceleration in bandpass frequency effect test.

APPENDIX A

FLIGHT SUMMARIES: SUBJECT SEATING, SUBJECT RESPONSES, AND INVESTIGATED MOTION STIMULI

Notes for Appendix A

TIFS FLIGHT. . . . . Each flight of the TIFS aircraft is assigned a unique number by the Calspan Corporation.

TDT. . . . . Identifies the number of the driving tape used to supply to the TIFS computer electrical inputs representing the desired motions.

INSTRUMENTATION. . . . . The University of Virginia has two instrumentation packages for measuring motion and environmental data. This entry indicates which equipment, PEMS I or PEMS II, was used on a given flight.

DATE . . . . . Date of the test flight.

SEAT . . . . . Refer to figure 2 for a seating diagram and numbering system used for the University of Virginia tests.

SUBJ . . . . . Subjects are identified by a code number which permits cross referencing responses with background, experience, and response scale interpretations in appendix B. Individual subject responses for each of the twenty flight segments are listed vertically under each SEAT and SUBJect code. In some cases, subjects failed to respond (represented by -0). On occasion, a

subject's responses during a given test were consistently beyond one standard deviation from the mean. His or her responses may then have been deleted from the results (indicated by 0).

N. . . . . The number of subjects whose responses were used in computing the mean and standard deviation for a given segment.

MEAN . . . . . The mean value of subject responses.

STD DEV. . . . . The standard deviation is calculated from: $S = \sqrt{\frac{\Sigma x^2}{N-1}}$ using N-1 rather than N in the denominator because sampled population was small.

VERT(R), TRANS(R), VERT(S), TRANS(S) . Represent vertical and transverse accelerations, random (R) and sinusoidal (S), respectively. Each is given in units of g rms.

ROLL(S), ROLL(R), YAW(R) . . . . . Represent sinusoidal roll, random roll, and random yaw rates, respectively. Each is given in units of rms radians per second.

TIFS FLIGHT 325 TDT 1 INSTRUMENTATION PEMS II DATE 8-12-74

	SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (R)	TRANS (R)
SEGMENT	SUBJ	20	15	13	21	8	4	22	12	23	7	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		3	3	4	4	3	3	6	4	5	3	10	3.80	1.033	2.4476E-02	2.7431E-02
2		5	3	6	5	4	5	7	6	4	4	10	4.90	1.197	2.4210E-02	4.8617E-02
3		2	2	2	3	2	2	3	2	1	2	10	2.10	.568	2.1658E-02	1.7571E-02
4		3	4	5	5	4	5	5	4	3	4	10	4.20	.789	2.3258E-02	4.2995E-02
5		5	5	7	6	5	5	7	5	6	6	10	5.70	.823	2.4153E-02	7.1127E-02
6		2	3	3	4	2	4	3	3	4	3	10	3.10	.738	2.1655E-02	2.7678E-02
7		2	4	4	4	3	5	3	4	4	4	10	3.70	.823	2.3357E-02	3.6007E-02
8		6	5	6	5	6	6	6	5	5	5	10	5.50	.527	2.4754E-02	6.4538E-02
9		2	1	2	4	2	2	2	3	1	3	10	2.20	.919	2.2324E-02	1.9750E-02
10		5	3	5	4	3	5	3	4	4	3	10	3.90	.876	2.0412E-02	5.2486E-02
11		4	4	4	5	4	6	3	4	4	4	10	4.20	.789	4.8414E-02	4.6008E-02
12		3	2	2	3	2	2	2	2	1	2	10	2.10	.568	4.2211E-02	1.7196E-02
13		6	5	5	5	6	7	6	5	5	6	10	5.60	.699	4.4659E-02	5.9655E-02
14		3	3	4	5	4	5	5	3	2	5	10	3.90	1.101	4.5126E-02	4.0758E-02
15		2	2	4	4	3	4	2	3	2	2	10	2.80	.919	4.3453E-02	2.9334E-02
16		5	4	7	3	6	7	7	5	5	6	10	5.50	1.354	4.2039E-02	6.5703E-02
17		4	4	4	6	3	5	3	4	4	5	10	4.30	1.059	4.5450E-02	4.3845E-02
18		2	2	3	4	2	2	2	2	2	2	10	2.30	.675	4.7973E-02	1.8524E-02
19		5	5	4	5	5	6	2	4	4	4	10	4.40	1.075	4.3595E-02	5.3373E-02
20		2	3	3	4	3	3	2	3	2	2	10	2.70	.675	4.5553E-02	2.7957E-02

TIFS FLIGHT 326 TOT 15 INSTRUMENTATION PEMS II DATE 8-12-74

	SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			ROLL (S)
SEGMENT	SUBJ	20	15	13	21	8	4	22	12	23	7	N	MEAN	STD DEV	RMS RAD/S
1		2	4	2	2	3	4	3	3	2	2	10	2.70	.823	3.05[illegible]E-02
2		5	5	4	4	6	6	5	5	3	4	10	4.70	.949	7.[illegible]71 6E-02
3		1	2	2	2	3	3	2	2	1	1	10	1.90	.738	1.507 6E-02
4		2	5	4	5	6	5	5	4	3	3	10	4.20	1.229	6.005 7E-02
5		2	4	2	3	4	4	3	3	3	1	10	2.90	.994	3.[illegible]27 1E-02
6		1	2	2	2	3	3	3	2	2	1	10	2.10	.738	1.573 5E-02
7		1	3	2	4	4	4	5	4	1	2	10	3.00	1.414	4.485 1E-02
8		2	4	3	3	6	5	5	5	2	3	10	3.80	1.398	5.95[illegible]4E-02
9		5	5	3	3	6	6	6	5	4	3	10	4.60	1.265	7.563 3E-02
10		2	3	2	3	3	5	4	3	2	2	10	2.9[illegible]	.994	3.[illegible]65 6E-02
11		1	1	2	2	2	2	2	2	1	1	10	1.60	.516	1.682 7E-02
12		2	2	-[illegible]	3	3	3	2	2	2	2	9	2.33	.500	6.462 9E-02
13		3	2	-0	2	3	2	3	2	1	2	9	2.22	.667	3.29[illegible] 3E-02
14		5	[illegible]	-0	4	5	3	6	3	1	2	9	3.67	1.581	8.13[illegible] 8E-02
15		3	3	3	3	3	2	3	2	2	2	10	2.60	.516	4.879 2E-02
16		3	2	2	2	2	2	3	2	1	1	10	2.00	.667	3.431 2E-02
17		5	3	2	2	3	3	3	2	2	3	10	2.80	.919	6.446 6E-02
18		2	1	1	1	2	2	2	2	1	3	10	1.70	.675	1.698 1E-02
19		3	4	3	2	4	4	5	4	3	3	10	3.50	.850	8.[illegible]53 0E-02
20		3	3	2	2	3	3	4	3	3	4	10	3.00	.667	4.846 5E-02

TIFS FLIGHT 327 TDT 12 INSTRUMENTATION PEMS II DATE 8-13-74

SEGMENT	SEAT / SUBJ	1 / 20	2 / 15	3 / 13	4 / 21	5 / 8	6 / 24	7 / 22	8 / 12	9 / 23	10 / 7	RESPONSE N	MEAN	STD DEV	VERT (S) (RMS G)	TRANS (S) (RMS G)
1		3	5	4	3	2	4	6	4	3	3	10	3.70	1.160	3.693[illegible]E-02	5.1916E-02
2		3	5	7	7	3	5	6	5	5	6	10	5.20	1.398	1.262[illegible]E-01	5.2131E-02
3		5	4	6	6	3	3	5	5	5	4	10	4.60	1.075	6.863[illegible]E-02	5.2002E-02
4		6	6	7	7	6	4	7	6	5	7	10	6.10	.994	1.594[illegible]E-01	5.2331E-02
5		6	4	6	6	5	3	5	5	4	5	10	4.90	.994	1.02[illegible]E-01	5.7279E-02
6		5	5	7	7	5	5	6	5	4	6	10	5.50	.972	1.323[illegible]E-01	5.3929E-02
7		5	4	7	7	3	2	7	5	3	3	10	4.60	1.897	6.723[illegible]E-02	5.1220E-02
8		4	6	7	7	3	5	7	6	5	5	10	5.50	1.354	1.60[illegible]5E-01	5.1284E-02
9		3	4	7	7	3	3	6	4	4	3	10	4.40	1.647	9.63[illegible]6E-02	5.1679E-02
10		2	4	6	6	4	2	5	4	3	3	10	3.90	1.449	3.843[illegible]7E-02	5.2020E-02
11		3	5	6	5	4	5	7	5	4	3	10	4.70	1.252	2.122[illegible]0E-02	8.6399E-02
12		3	4	7	6	5	3	6	6	5	4	10	4.90	1.370	6.687[illegible]2E-02	8.5384E-02
13		3	4	7	6	6	4	7	6	4	5	10	5.20	1.398	9.49[illegible]1E-02	8.5227E-02
14		3	5	6	6	4	4	6	5	4	4	10	4.70	1.059	5.16[illegible]9E-02	8.6119E-02
15		2	4	6	6	5	3	5	6	5	5	10	4.70	1.337	8.435[illegible]0E-02	8.5444E-02
16		2	4	6	7	5	5	5	5	4	4	10	4.70	1.337	5.634[illegible]8E-02	8.6712E-02
17		3	5	5	-0	5	4	6	6	4	4	9	4.67	1.000	1.[illegible]2[illegible]0E-01	8.6923E-02
18		4	5	6	-0	4	5	6	5	3	3	9	4.56	1.130	5.153[illegible]5E-02	9.3018E-02
19		5	5	6	-0	4	4	5	4	4	3	9	4.44	.882	8.34[illegible]6E-02	8.7936E-02
20		3	4	6	-0	3	4	7	4	3	2	9	4.00	1.581	3.572[illegible]1E-02	8.6902E-02

TIFS FLIGHT 328 TDT 2 INSTRUMENTATION PEMS II DATE 8-13-74

SEGMENT	SEAT SURJ	1 20	2 15	3 13	4 21	5 8	6 24	7 22	8 12	9 23	10 7	RESPONSE N	MEAN	STD DEV	ROLL (R) RMS RAD/S	YAW (R) RMS RAD/S
1		0	2	1	1	2	1	1	2	1	1	9	1.33	.500	9.1919E-03	4.3231E-03
2		0	2	1	2	2	1	1	2	1	1	9	1.44	.527	1.3270E-02	7.8269E-03
3		0	2	2	1	2	1	1	2	1	2	9	1.56	.527	9.2764E-03	5.3664E-03
4		0	2	2	1	2	2	2	2	2	2	9	1.89	.333	8.4139E-03	9.0789E-03
5		0	2	2	1	2	2	2	2	2	2	9	1.89	.333	8.4168E-03	6.0214E-03
6		0	2	2	1	2	2	1	3	3	3	9	2.11	.782	9.2175E-03	5.2138E-03
7		0	3	2	1	2	2	2	4	2	2	9	2.22	.833	1.2468E-02	8.3602E-03
8		0	2	2	-0	2	1	2	3	2	2	8	2.00	.535	9.8276E-03	6.3257E-03
9		0	3	2	-0	2	2	2	2	2	3	8	2.25	.463	8.8127E-03	7.6490E-03
10		0	2	2	1	2	1	2	3	2	2	9	1.89	.601	7.3408E-03	9.2617E-03
11		0	3	1	2	2	1	2	2	1	2	9	1.78	.667	2.2754E-02	6.1858E-03
12		0	3	1	2	3	1	2	3	1	2	9	2.00	.866	1.9916E-02	2.5822E-03
13		0	2	1	1	3	2	2	2	1	2	9	1.78	.667	2.7571E-02	9.4852E-03
14		0	3	1	1	3	1	3	2	1	1	9	1.78	.972	2.5292E-02	5.8814E-03
15		0	2	3	1	3	1	5	2	1	1	9	2.11	1.364	2.2234E-02	9.6782E-03
16		0	3	3	2	3	1	3	2	1	2	9	2.22	.833	2.0092E-02	6.6843E-03
17		0	2	2	2	3	2	2	3	1	2	9	2.11	.601	2.2296E-02	4.6444E-03
18		0	2	2	1	3	1	2	2	2	1	9	1.78	.667	2.0188E-02	2.3258E-03
19		0	2	2	2	3	1	2	2	1	2	9	1.89	.601	2.1815E-02	6.2194E-03
20		0	3	2	2	3	2	2	3	1	2	9	2.22	.667	2.2091E-02	1.0602E-02

TIFS FLIGHT 328 TOT 2 INSTRUMENTATION PEMS II DATE 8-13-74

SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			ROLL (R)	YAW (R)
SEGMENT SUBJ	20	15	13	21	8	24	22	12	23	7	N	MEAN	STD DEV	RMS RAD/S	RMS RAD/S
1	3	2	1	1	2	1	1	2	1	1	10	1.50	.707	9.1919E-03	4.3231E-03
2	4	2	1	2	2	1	1	2	1	1	10	1.70	.949	1.3270E-02	7.8269E-03
3	6	2	2	1	2	1	1	2	1	2	10	2.00	1.491	9.2754E-03	5.3664E-03
4	5	2	2	1	2	2	2	2	2	2	10	2.20	1.033	8.4139E-03	9.0789E-03
5	5	2	2	1	2	2	2	2	2	2	10	2.20	1.033	8.4158E-03	6.0214E-03
6	6	2	2	1	2	2	1	3	3	3	10	2.50	1.434	9.2175E-03	5.2138E-03
7	3	3	2	1	2	2	2	4	2	2	10	2.30	.823	1.2450E-02	8.3602E-03
8	6	2	2	-0	2	1	2	3	2	2	9	2.44	1.424	9.8276E-03	6.3257E-03
9	6	3	2	-0	2	2	2	2	2	3	9	2.67	1.323	8.8127E-03	7.6490E-03
10	5	2	2	1	2	1	2	3	2	2	10	2.20	1.135	7.3418E-03	9.2617E-03
11	3	3	1	2	2	1	2	2	1	2	10	1.90	.738	2.2754E-02	6.1858E-03
12	3	3	1	2	3	1	2	3	1	2	10	2.10	.876	1.9916E-02	2.5822E-03
13	-0	2	1	1	3	2	2	2	1	2	9	1.78	.667	2.7571E-02	9.4852E-03
14	-0	3	1	1	3	1	3	2	1	1	9	1.78	.972	2.5232E-02	5.0814E-03
15	-0	2	3	1	3	1	5	2	1	1	9	2.11	1.364	2.2234E-02	3.6782E-03
16	-0	3	3	2	3	1	3	2	1	2	9	2.22	.833	2.0032E-02	6.6843E-03
17	-0	2	2	2	3	2	2	3	1	2	9	2.11	.601	2.2296E-02	4.6444E-03
18	-0	2	2	1	3	1	2	2	2	1	9	1.78	.667	2.0198E-02	2.3258E-03
19	-0	2	2	2	3	1	2	2	1	2	9	1.89	.601	2.1815E-02	6.2194E-03
20	-0	3	2	2	3	2	2	3	1	2	9	2.22	.667	2.2091E-02	1.0602E-02

TIFS FLIGHT 332 TDT 8 INSTRUMENTATION PEMS II DATE 8-14-74

SEGMENT	SEAT / SUBJ	1 13	2 C	3 21	4 15	5 24	6 8	7 7	8 23	9 12	10 4	RESPONSE N	MEAN	STD DEV	VERT (R) (RMS G)	TRANS (R) (RMS G)
1		5	-0	4	4	3	4	5	2	6	5	9	4.22	1.202	5.2471E-02	5.5643E-02
2		5	-0	5	5	4	4	5	5	6	6	9	5.00	.707	1.0834E-01	5.4924E-02
3		4	-0	5	5	3	5	4	4	5	5	9	4.44	.726	3.4759E-02	5.9592E-02
4		5	-0	6	6	5	5	6	5	6	6	9	5.56	.527	1.4335E-01	5.4417E-02
5		4	-0	6	6	3	5	5	4	5	7	9	5.00	1.225	8.8243E-02	5.8928E-02
6		4	-0	5	5	3	5	4	3	5	7	9	4.56	1.236	3.6512E-02	5.6725E-02
7		4	-0	5	5	4	4	5	4	5	6	9	4.67	.707	8.2758E-02	6.0240E-02
8		4	-0	5	4	5	4	5	3	5	6	9	4.56	.882	5.8974E-02	5.4848E-02
9		5	-0	6	5	6	5	6	5	6	7	9	5.67	.707	1.5158E-01	6.0951E-02
10		4	-0	5	4	5	4	5	4	6	7	9	4.89	1.054	1.1879E-01	5.9047E-02
11		3	-0	5	4	3	4	4	3	4	4	9	3.78	.667	1.1653E-01	2.1242E-02
12		4	-0	-0	5	6	5	4	3	4	4	8	4.38	.916	1.5054E-01	2.2831E-02
13		3	-0	-0	4	2	3	3	1	4	3	8	2.88	.991	5.8733E-02	2.2266E-02
14		3	-0	-0	3	2	2	2	1	3	3	8	2.38	.744	8.4553E-02	2.1224E-02
15		2	-0	-0	2	1	3	1	1	2	2	8	1.75	.707	3.1112E-02	2.0288E-02
16		3	-0	-0	4	2	3	2	2	3	4	8	2.88	.835	1.1371E-01	2.1083E-02
17		3	-0	-0	4	2	3	2	2	4	4	8	3.00	.926	1.1[illegible]9E-01	2.2401E-02
18		3	-0	4	5	2	4	5	3	5	5	9	4.00	1.118	1.5649E-01	2.2127E-02
19		2	-0	4	3	3	3	2	1	3	2	9	2.56	.882	3.3372E-02	2.4153E-02
20		2	-0	4	3	1	2	2	1	2	3	9	2.22	.972	6.0681E-02	2.1911E-02

TIFS FLIGHT 332 TOT 4 INSTRUMENTATION PEMS II DATE 8-14-74

SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (R)	TRANS (R)
SEGMENT	SUBJ	13	0	21	15	24	8	7	23	12	4	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		5	-0	4	4	3	4	5	2	6	0	8	4.13	1.246	5.2471E-02	5.5643E-02
2		5	-0	5	5	4	4	5	5	6	0	8	4.88	.641	1.0834E-01	5.4924E-02
3		4	-0	5	5	3	5	4	4	5	0	8	4.38	.744	3.4769E-02	5.9592E-02
4		5	-0	6	6	5	5	6	5	6	0	8	5.50	.535	1.4335E-01	5.4417E-02
5		4	-0	5	6	3	5	5	4	5	0	8	4.75	1.035	8.8243E-02	5.8928E-02
6		4	-0	5	5	3	5	4	3	5	0	8	4.25	.886	3.6532E-02	5.6725E-02
7		4	-0	5	5	4	4	5	4	5	0	8	4.50	.535	8.2758E-02	6.0240E-02
8		4	-0	5	4	5	4	5	3	5	0	8	4.38	.744	5.8974E-02	5.4848E-02
9		5	-0	6	5	6	5	6	5	6	0	8	5.50	.535	1.5158E-01	6.0951E-02
10		4	-0	5	4	5	4	5	4	6	0	8	4.63	.744	1.1879E-01	5.9047E-02
11		3	-0	5	4	3	4	4	3	4	0	8	3.75	.707	1.1663E-01	2.1242E-02
12		4	-0	-0	5	6	5	4	3	4	0	7	4.43	.976	1.5064E-01	2.2831E-02
13		3	-0	-0	4	2	3	3	1	4	0	7	2.86	1.069	5.8783E-02	2.2260E-02
14		3	-0	-0	3	2	2	2	1	3	0	7	2.29	.756	3.4563E-02	2.1224E-02
15		2	-0	-0	2	1	3	1	1	2	0	7	1.71	.756	3.1102E-02	2.0288E-02
16		3	-0	-0	4	2	3	2	2	3	0	7	2.71	.756	1.1371E-01	2.1083E-02
17		3	-0	-0	4	2	3	2	2	4	0	7	2.86	.900	1.0109E-01	2.2401E-02
18		3	-0	4	5	2	4	5	3	5	0	8	3.88	1.126	1.5645E-01	2.2127E-02
19		2	-0	4	3	3	3	2	1	3	0	8	2.63	.916	3.3372E-02	2.4153E-02
20		2	-0	4	3	1	2	2	1	2	0	8	2.13	.991	6.0681E-02	2.1911E-02

TIFS FLIGHT 333 TDT 10 INSTRUMENTATION PENS II DATE 8-15-74

	SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (R)	TRANS (R)
SEGMENT	SUBJ	13	21	20	15	24	8	7	23	12	22	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		3	2	2	2	1	2	2	1	2	1	10	1.80	.632	2.5323E-02	1.4734E-02
2		3	2	3	2	1	2	2	1	2	1	10	1.90	.738	4.4858E-02	1.4541E-02
3		4	2	2	3	2	3	4	1	4	2	10	2.70	1.059	8.1026E-02	1.5058E-02
4		5	2	2	3	2	3	4	2	4	3	10	3.00	1.054	1.0150E-01	1.4356E-02
5		4	2	2	2	1	2	3	2	4	2	10	2.40	.966	6.2135E-02	1.3786E-02
6		5	4	3	4	3	4	5	3	5	5	10	4.10	.876	1.4678E-01	1.4037E-02
7		4	2	4	3	1	2	3	1	4	4	10	2.80	1.229	5.4921E-02	1.4163E-02
8		4	2	2	2	1	3	2	1	3	3	10	2.30	.949	3.2023E-02	1.3816E-02
9		5	4	5	3	3	3	5	2	4	5	10	3.90	1.101	1.0946E-01	1.3856E-02
10		4	-0	3	2	5	3	4	2	3	6	9	3.56	1.333	8.9628E-02	2.0402E-02
11		4	-0	4	3	2	3	4	3	4	5	9	3.56	.882	8.0823E-02	2.5632E-02
12		5	-.	3	3	3	4	5	2	5	3	9	3.67	1.118	1.0474E-01	2.5715E-02
13		4	-0	6	3	2	3	5	2	3	3	9	3.44	1.333	3.2458E-02	2.5446E-02
14		4	-0	5	3	2	3	5	3	3	3	9	3.44	1.014	5.5638E-02	2.5689E-02
15		-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	0	.00	.000	.0	.0
16		4	-0	3	3	5	4	5	2	3	3	9	3.56	1.014	6.0274E-02	2.6637E-02
17		3	-0	2	2	2	5	5	2	3	3	9	3.00	1.225	1.1210E-01	2.5698E-02
18		4	-0	2	2	3	5	6	3	5	5	9	3.89	1.453	1.3857E-01	2.5356E-02
19		5	-0	2	3	4	5	6	4	5	5	9	4.33	1.225	3.3239E-02	2.4800E-02
20		4	-0	1	3	2	3	4	2	4	3	9	2.89	1.054	6.9159E-02	9.6493E-03

TIFS FLIGHT 334 TDT 3 INSTRUMENTATION PEMS II DATE 8-15-74

	SEAT	1	2	3	4	5	6	7	8	9	10	R E S P O N S E			ROLL (S)
SEGMENT	SUBJ	13	21	20	15	8	24	23	7	22	12	N	MEAN	STD DEV	RMS RAD/S
1		2	2	3	3	2	1	2	2	3	2	10	2.20	.632	6.709 2E-02
2		2	2	2	3	3	2	3	2	5	2	10	2.6.	.966	8.965 8E-02
3		2	1	1	2	2	2	1	1	3	2	10	1.70	.675	2.201 1E-02
4		1	2	5	3	3	3	1	2	6	2	10	2.80	1.619	1.135 9E-01
5		2	2	3	2	2	2	1	2	5	2	10	2.30	1.059	4.552 6E-02
6		2	3	6	3	3	2	1	3	6	3	10	3.20	1.619	1.55. 2E-01
7		2	1	3	2	2	1	1	2	6	2	10	2.20	1.476	7.661 3E-02
8		2	2	5	3	3	3	2	5	7	4	10	3.60	1.647	1.967 0E-01
9		2	2	3	3	2	2	1	5	7	2	10	2.90	1.792	1.153 4E-01
10		2	2	2	3	2	1	1	2	6	2	10	2.30	1.418	3.895 2E-02
11		2	2	2	2	2	1	1	1	6	2	10	2.10	1.449	4.151 1E-02
12		3	-.	3	3	2	2	1	5	6	3	9	3.11	1.537	1.225 6E-01
13		4	2	7	4	7	5	5	7	7	5	10	5.30	1.703	2.089 9E-01
14		3	3	6	3	7	4	4	6	6	3	10	4.50	1.581	8.515 1E-02
15		4	5	5	5	7	5	5	7	7	6	10	5.60	1.075	1.671 4E-01
16		3	4	5	3	6	4	3	5	6	2	10	4.10	1.37.	4.953 9E-02
17		3	4	6	4	6	6	2	7	6	3	10	4.70	1.703	1.191 9E-01
18		3	2	4	3	6	3	1	7	6	2	10	3.70	2.003	3.651 8E-02
19		4	-0	7	4	6	6	3	7	6	2	9	5.00	1.803	9.483 5E-02
20		3	-.	4	3	6	6	2	6	6	2	9	4.22	1.787	7.034 9E-02

TIFS FLIGHT 334 TDT 3 INSTRUMENTATION PEMS II DATE 8-15-74

	SEAT	1	2	3	4	5	6	7	8	9	10	R E S P O N S E			ROLL (S)
SEGMENT	SUBJ	13	21	20	15	8	24	23	7	22	12	N	MEAN	STD DEV	RMS RAD/S
1		2	2	3	3	2	1	2	2	0	2	9	2.11	.601	6.7082E-02
2		2	2	2	3	3	2	3	2	0	2	9	2.33	.500	8.9668E-02
3		2	1	1	2	2	2	1	1	0	2	9	1.56	.527	2.2011E-02
4		1	2	5	3	3	3	1	2	0	2	9	2.44	1.236	1.1359E-01
5		2	2	3	2	2	2	1	2	0	2	9	2.00	.500	4.5526E-02
6		2	3	6	3	3	2	1	3	0	3	9	2.89	1.364	1.5542E-01
7		2	1	3	2	2	1	1	2	0	2	9	1.78	.667	7.6613E-02
8		2	2	5	3	3	3	2	5	0	4	9	3.22	1.202	1.9670E-01
9		2	2	3	3	2	2	1	5	0	2	9	2.44	1.130	1.1534E-01
10		2	2	2	3	2	1	1	2	0	2	9	1.89	.601	3.5952E-02
11		2	2	2	2	2	1	1	1	0	2	9	1.67	.500	4.1511E-02
12		3	-0	3	3	2	2	1	5	0	3	9	2.75	1.165	1.2266E-01
13		4	2	7	4	7	5	5	7	0	5	9	5.11	1.691	2.0899E-01
14		3	3	6	3	7	4	4	6	0	3	9	4.33	1.581	8.5161E-02
15		4	5	5	5	7	5	5	7	0	6	9	5.44	1.014	1.6714E-01
16		3	4	5	3	6	4	3	5	0	2	9	3.89	1.269	4.9539E-02
17		3	4	6	4	6	6	2	7	0	3	9	4.56	1.740	1.1919E-01
18		3	2	4	3	6	3	1	7	0	2	9	3.44	1.944	3.6518E-02
19		4	-0	7	4	6	6	3	7	0	2	8	4.88	1.885	9.4885E-02
20		3	-0	4	3	6	6	2	6	0	2	8	4.00	1.773	7.0449E-02

TIFS FLIGHT 351 TOT 9 INSTRUMENTATION PEMS I DATE 9-13-74

	SEAT	1	2	3	4	5	6	7	8	9	10	R E S P O N S E			VERT (R)	TRANS (R)
SEGMENT	SUBJ	28	8	27	23	25	7	13	15	4	12	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		2	2	2	1	2	2	3	3	3	2	10	2.20	.632	2.5654E-02	2.5890E-02
2		5	2	2	3	5	3	4	3	4	2	10	3.30	1.160	5.49[illegible]8E-02	2.8091E-02
3		5	4	2	5	5	5	5	5	5	3	10	4.50	1.179	1.0437E-01	2.8821E-02
4		4	2	2	4	4	4	4	3	4	2	10	3.30	.949	4.1353E-02	2.5242E-02
5		5	3	2	3	3	5	5	4	3	3	10	3.60	1.075	7.74[illegible]7E-02	2.7383E-02
6		4	2	2	3	3	4	4	3	3	2	10	3.00	.816	4.7694E-02	2.7199E-02
7		5	3	3	6	3	6	5	4	5	3	10	4.30	1.252	1.1140E-01	2.6825E-02
8		4	2	2	3	3	4	3	3	3	2	10	2.90	.738	3.1375E-02	2.7165E-02
9		5	3	4	5	-0	5	4	3	4	-0	8	4.13	.835	9.1679E-02	2.8959E-02
10		4	2	4	3	-0	5	3	3	4	2	9	3.33	1.000	7.1053E-02	2.8196E-02
11		6	4	6	6	-0	5	3	4	5	2	9	4.56	1.424	6.9636E-02	7.2307E-02
12		6	5	6	6	-0	6	4	5	6	3	9	5.22	1.093	1.2149E-01	7.8437E-02
13		6	4	5	5	6	5	4	4	6	2	10	4.70	1.252	3.3236E-02	7.5748E-02
14		6	5	5	5	6	5	3	4	7	5	10	5.10	1.101	9.1513E-02	7.5822E-02
15		6	4	5	4	5	5	4	4	6	4	10	4.70	.823	5.0430E-02	7.1659E-02
16		6	4	6	5	5	6	4	4	5	4	10	4.90	.876	1.2472E-01	7.3823E-02
17		6	3	5	4	5	5	4	3	5	2	10	4.20	1.229	7.0736E-02	7.6447E-02
18		6	3	6	6	6	6	3	4	6	2	10	4.80	1.619	9.8270E-02	7.5573E-02
19		6	3	5	3	5	6	4	3	5	2	10	4.20	1.398	4.7237E-02	7.4117E-02
20		6	3	4	4	5	5	-0	3	5	1	9	4.11	1.616	3.2741E-02	7.4891E-02

TIFS FLIGHT 351 TDT 9 INSTRUMENTATION PEMS I DATE 9-13-74

	SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (R)	TRANS (R)
SEGMENT	SUBJ	28	9	27	20	25	7	13	15	4	12	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		2	2	2	1	2	2	3	3	3	0	9	2.22	.667	2.5664E-02	2.5890E-02
2		5	2	2	3	5	3	4	3	4	0	9	3.44	1.130	5.4908E-02	2.8091E-02
3		5	4	2	5	5	6	5	5	5	0	9	4.67	1.118	1.0497E-01	2.8821E-02
4		4	2	2	4	4	4	4	3	4	0	9	3.44	.882	4.1363E-02	2.5242E-02
5		5	3	2	3	3	5	5	4	3	0	9	3.67	1.118	7.7407E-02	2.7383E-02
6		4	2	2	3	3	4	4	3	3	0	9	3.11	.782	4.7694E-02	2.7199E-02
7		5	3	3	6	3	6	5	4	5	0	9	4.44	1.236	1.1140E-01	2.6825E-02
8		4	2	2	3	3	4	3	3	3	0	9	3.00	.707	3.1375E-02	2.7165E-02
9		5	3	4	5	-0	5	4	3	4	0	8	4.13	.835	9.1679E-02	2.8959E-02
10		4	2	4	3	-0	5	3	3	4	0	8	3.50	.926	7.1053E-02	2.8196E-02
11		6	4	6	6	-0	5	3	4	5	0	9	4.88	1.126	6.9656E-02	7.2307E-02
12		6	5	6	5	-0	6	4	5	6	0	8	5.50	.756	1.2149E-01	7.8437E-02
13		6	4	5	5	6	5	4	4	6	0	9	5.00	.866	3.3296E-02	7.5748E-02
14		6	5	5	5	6	5	3	4	7	0	9	5.11	1.167	9.1513E-02	7.5822E-02
15		6	4	5	4	5	5	4	4	5	0	9	4.78	.833	5.0490E-02	7.1659E-02
16		6	4	6	5	5	6	4	4	5	0	9	5.00	.866	1.2472E-01	7.3823E-02
17		6	3	5	4	5	5	4	3	5	0	9	4.44	1.014	7.0786E-02	7.6447E-02
18		6	3	6	6	6	6	3	4	6	0	9	5.11	1.364	9.8270E-02	7.5573E-02
19		6	3	5	3	5	6	4	3	5	0	9	4.44	1.236	4.7247E-02	7.4117E-02
20		6	3	4	4	5	6	-0	3	5	0	8	4.50	1.195	3.2741E-02	7.4891E-02

TIFS FLIGHT 352 TOT 14 INSTRUMENTATION PEMS I DATE 9-13-74

	SEAT	1	2	3	4	5	6	7	8	9	10	R E S P O N S E			VERT (S)	TRANS (S)
SEGMENT	SUBJ	4	28	20	27	25	7	13	8	12	15	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		4	5	3	6	6	3	4	3	3	3	10	4.00	1.247	2.1073E-02	8.6695E-02
2		3	5	4	6	6	2	4	3	3	3	10	3.90	1.370	6.4991E-02	8.6922E-02
3		4	5	3	6	6	4	4	4	3	3	10	4.20	1.135	9.7388E-02	8.4024E-02
4		4	5	4	6	6	3	5	3	3	3	10	4.20	1.229	4.7744E-02	8.2726E-02
5		5	5	4	6	6	-0	5	3	3	3	9	4.44	1.236	8.6097E-02	8.4869E-02
6		5	5	5	6	6	5	4	3	3	3	10	4.60	1.265	6.3230E-02	8.6846E-02
7		5	5	3	7	5	5	4	5	3	3	10	4.50	1.269	1.0653E-01	8.6605E-02
8		5	5	2	6	4	3	4	4	2	3	10	3.80	1.317	4.6151E-02	8.8969E-02
9		6	5	4	6	4	3	4	4	3	3	10	4.20	1.135	8.6979E-02	8.9677E-02
10		6	5	4	6	4	-0	4	3	2	3	9	4.11	1.364	3.1613E-02	8.9783E-02

TIFS FLIGHT 353 TDT 4 INSTRUMENTATION PEMS I DATE 9-14-74

	SEAT	1	2	3	4	5	6	7	8	9	10	R E S P O N S E			VERT (R)	TRANS (R)
SEGMENT	SUBJ	4	8	1	12	30	20	13	25	23	7	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		3	2	2	2	2	5	3	3	1	2	10	2.50	1.080	6.491 4E-02	2.8263E-02
2		5	4	3	2	5	4	3	3	2	3	10	3.40	1.075	6.761 5E-02	5.3294E-02
3		4	2	2	2	3	3	3	3	1	3	10	2.60	.843	6.122 7E-02	1.5286E-02
4		5	3	3	3	4	3	3	3	1	4	10	3.20	1.033	6.342 4E-02	4.6958E-02
5		6	4	3	3	6	4	4	4	2	2	10	3.80	1.398	5.803 4E-02	5.8874E-02
6		4	4	2	2	3	3	3	3	1	2	10	2.70	.949	6.157 2E-02	2.4379E-02
7		5	4	2	2	3	2	3	3	-0	1	9	2.78	1.202	6.551 4E-02	3.3444E-02
8		6	5	3	3	6	3	4	3	-0	3	9	4.00	1.323	6.583 4E-02	6.1735E-02
9		4	4	2	3	4	2	2	3	-0	2	9	2.89	.928	6.413 2E-02	1.4867E-02
10		5	4	3	2	3	3	2	-0	-0	3	8	3.13	.991	6.565 4E-02	4.7823E-02
11		6	5	2	2	5	2	3	-0	-0	2	8	3.38	1.685	3.607 9E-02	4.3043E-02
12		3	4	2	2	2	1	2	-0	-0	3	8	2.38	.916	3.185 9E-02	1.4194E-02
13		6	5	3	4	4	5	3	-0	-0	2	8	4.00	1.309	3.411 8E-02	5.8091E-02
14		5	4	3	3	3	4	3	-0	-0	2	8	3.38	.916	3.766 6E-02	3.6103E-02
15		4	3	2	2	3	1	3	-0	-0	2	8	2.50	.926	3.341 3E-02	2.7320E-02
16		7	5	3	4	5	2	-0	-0	-0	4	7	4.29	1.604	3.443 9E-02	6.2508E-02
17		5	4	2	2	4	2	-0	-0	1	3	8	2.88	1.356	3.435 1E-02	3.9184E-02
18		3	3	2	2	2	1	-0	-0	1	3	8	2.13	.835	3.675 3E-02	1.2888E-02
19		5	4	3	3	4	3	3	-0	2	3	9	3.33	.866	3.397 5E-02	4.8526E-02
20		3	3	2	2	2	1	2	-0	1	2	9	2.00	.707	2.977 8E-02	1.8987E-02

TIFS FLIGHT 353 TDT 4 INSTRUMENTATION PEMS I DATE 9-14-74

	SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (R)	TRANS (R)
SEGMENT	SUBJ	4	8	15	12	30	20	13	25	23	7	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		0	2	2	2	2	5	3	3	0	2	8	2.63	1.061	6.4904E-02	2.8263E-02
2		0	4	3	2	5	4	3	3	0	3	8	3.38	.916	6.7615E-02	5.3294E-02
3		0	2	2	2	3	3	3	3	0	3	8	2.63	.518	6.1227E-02	1.5286E-02
4		0	3	3	3	4	3	3	3	0	4	8	3.25	.463	6.0424E-02	4.6958E-02
5		0	4	3	3	6	4	4	4	0	2	8	3.75	1.165	5.8034E-02	5.8874E-02
6		0	4	2	2	3	3	3	3	0	2	8	2.75	.707	6.1572E-02	2.4379E-02
7		0	4	2	2	3	2	3	3	0	1	8	2.50	.926	6.5534E-02	3.3444E-02
8		0	5	3	3	6	3	4	3	0	3	8	3.75	1.165	6.5894E-02	6.1735E-02
9		0	4	2	3	4	2	2	3	0	2	8	2.75	.886	6.4192E-02	1.4867E-02
10		0	4	3	2	3	3	2	-0	0	3	7	2.86	.690	6.5664E-02	4.7823E-02
11		0	5	2	2	5	2	3	-0	0	2	7	3.00	1.414	3.6079E-02	4.3043E-02
12		0	4	2	2	2	1	2	-0	0	3	7	2.29	.951	3.1859E-02	1.4194E-02
13		0	5	3	4	4	5	3	-0	0	2	7	3.71	1.113	3.4148E-02	5.8091E-02
14		0	4	3	3	3	4	3	-0	0	2	7	3.14	.690	3.7646E-02	3.6103E-02
15		0	3	2	2	3	1	3	-0	0	2	7	2.29	.756	3.3413E-02	2.7320E-02
16		0	5	3	4	5	2	-0	-0	0	4	6	3.83	1.169	3.4499E-02	6.2508E-02
17		0	4	2	2	4	2	-0	-0	0	3	6	2.83	.983	3.4351E-02	3.9184E-02
18		0	3	2	2	2	1	-0	-0	0	3	6	2.17	.753	3.6763E-02	1.2888E-02
19		0	4	3	3	4	3	3	-0	0	3	7	3.29	.488	3.3975E-02	4.8526E-02
20		0	3	2	2	2	1	2	-0	0	2	7	2.00	.577	2.9778E-02	1.8987E-02

TIFS FLIGHT 354 TDT 11 INSTRUMENTATION PEMS I DATE 9-14-74

SEGMENT	SEAT / SUBJ	1 / 20	2 / 15	3 / 13	4 / 25	5 / 8	6 / 4	7 / 30	8 / 12	9 / 23	10 / 7	RESPONSE N	MEAN	STD DEV	ROLL (R) RMS RAD/S	YAW (R) RMS RAD/S
1		3	3	2	2	2	2	1	2	1	2	10	2.00	.667	.0	.0
2		3	2	2	2	2	2	1	2	1	2	10	1.90	.568	1.85[illegible]5E-02	6.8721E-03
3		2	2	2	2	2	3	2	2	1	2	10	2.00	.471	5.0[illegible]52E-03	7.1077E-03
4		3	2	2	3	2	3	2	2	1	2	10	2.20	.632	4.91[illegible]1E-03	2.4297E-03
5		3	2	2	3	3	3	3	2	1	1	10	2.30	.823	5.911[illegible]4E-03	5.2140E-03
6		5	2	3	3	3	3	2	2	1	1	10	2.50	1.179	5.337[illegible]3E-03	2.5606E-03
7		4	2	3	3	2	2	2	2	1	1	10	2.20	.919	1.07[illegible]0E-02	7.5752E-03
8		6	2	2	3	2	2	2	2	1	-0	9	2.44	1.424	1.453[illegible]9E-02	3.8043E-03
9		5	3	2	3	2	2	3	2	1	1	10	2.40	1.174	1.42[illegible]0E-02	9.4214E-03
10		5	3	3	3	2	2	3	2	1	1	10	2.50	1.179	8.08[illegible]1E-03	4.1039E-03
11		6	3	3	3	2	3	3	2	1	3	10	2.90	1.287	1.10[illegible]4E-02	1.2768E-03
12		5	2	2	3	2	2	2	3	1	2	10	2.40	1.075	4.752[illegible]4E-02	4.4441E-03
13		7	3	3	3	2	2	3	3	1	3	10	3.00	1.563	1.20[illegible]1E-02	1.3331E-03
14		6	3	2	3	2	2	2	2	1	3	10	2.60	1.35[illegible]	3.64[illegible]4E-02	1.9671E-03
15		5	3	3	3	3	4	2	2	1	4	10	3.00	1.155	2.03[illegible]9E-02	1.7878E-03
16		6	3	3	3	3	3	2	2	1	4	10	3.00	1.333	5.453[illegible]3E-02	6.1936E-03
17		5	4	3	-0	3	3	3	2	1	3	9	3.00	1.118	3.735[illegible]7E-02	1.1321E-02
18		5	3	3	-0	3	3	3	2	1	2	9	2.78	1.093	4.413[illegible]3E-02	3.3825E-03
19		5	3	3	-0	2	2	3	2	1	2	9	2.56	1.130	2.58[illegible]8E-02	1.8777E-03
20		5	2	3	-0	3	4	3	3	1	3	9	3.00	1.118	1.452[illegible]0E-02	1.4158E-03

TIFS FLIGHT 354 TOT 11 INSTRUMENTATION PEMS I DATE 9-14-74

	SEAT	1	2	3	4	5	6	7	8	9	10	R E S P O N S E			ROLL (R)	YAW (R)
SEGMENT	SUBJ	20	15	13	25	8	4	30	12	23	7	N	MEAN	STD DEV	RMS RAD/S	RMS RAD/S
1		0	3	2	2	2	2	1	2	0	2	8	2.00	.535	.0	.0
2		0	2	2	2	2	2	1	2	0	2	9	1.88	.354	1.8545E-02	6.8721E-03
3		0	2	2	2	2	3	2	2	0	2	9	2.13	.354	5.0362E-03	7.1077E-03
4		0	2	2	3	2	3	2	2	0	2	8	2.25	.463	4.9141E-03	2.4297E-03
5		0	2	2	3	3	3	3	2	0	1	9	2.38	.744	5.9114E-03	5.2140E-03
6		0	2	3	3	3	3	2	2	0	1	8	2.38	.744	5.3373E-03	2.5606E-03
7		0	2	3	3	2	2	2	2	0	1	8	2.13	.641	1.0710E-02	7.5752E-03
8		0	2	2	3	2	2	2	2	0	-0	7	2.14	.378	1.4539E-02	3.8043E-03
9		0	3	2	3	2	2	3	2	0	1	9	2.25	.707	1.4200E-02	9.4214E-03
10		0	3	3	3	2	2	3	2	0	1	9	2.38	.744	8.0871E-03	4.1039E-03
11		0	3	3	3	2	3	3	2	0	3	9	2.75	.463	1.1004E-02	1.2768E-03
12		0	2	2	3	2	2	2	3	0	2	8	2.25	.463	4.7524E-02	4.4441E-03
13		0	3	3	3	2	2	3	3	0	3	8	2.75	.463	1.2051E-02	1.3331E-03
14		0	3	2	3	2	2	2	2	0	3	9	2.38	.518	3.6404E-02	1.9671E-03
15		0	3	3	3	3	4	2	2	0	4	9	3.00	.756	2.0339E-02	1.7878E-03
16		0	3	3	3	3	3	2	2	0	4	9	2.88	.641	5.4533E-02	6.1936E-03
17		0	4	3	-0	3	3	3	2	0	3	7	3.00	.577	3.7357E-02	1.1321E-02
18		0	3	3	-0	3	3	3	2	0	2	7	2.71	.488	4.4133E-02	3.3825E-03
19		0	3	3	-0	2	2	3	2	0	2	7	2.43	.535	2.5808E-02	1.8777E-03
20		0	2	3	-0	3	4	3	3	0	3	7	3.00	.577	1.4520E-02	1.4158E-03

TIFS FLIGHT 355 TOT 13 INSTRUMENTATION PEMS I DATE 9-14-74

SEGMENT	SEAT 1 2 3 4 5 6 7 8 9 10 / SUBJ 0 23 7 13 25 4 8 15 30 20	RESPONSE N	MEAN	STD DEV	VERT (S) (RMS G)	TRANS (S) (RMS G)
1	-0 0 3 2 3 3 2 2 3 2	8	2.50	.535	1.4642E-02	1.4703E-02
2	-0 0 3 4 5 5 4 3 5 4	8	4.13	.835	1.5406E-02	5.2390E-02
3	-0 0 2 3 5 4 2 2 5 3	8	3.25	1.282	1.7707E-02	2.6814E-02
4	-0 0 4 4 6 6 4 3 6 4	8	4.63	1.188	1.8196E-02	6.4382E-02
5	-0 0 4 3 5 4 3 2 5 3	8	3.63	1.061	1.6076E-02	4.1269E-02
6	-0 0 4 4 5 5 5 3 5 4	8	4.38	.744	1.5503E-02	5.2993E-02
7	-0 0 4 3 4 4 3 2 4 2	8	3.25	.886	1.9707E-02	2.8665E-02
8	-0 0 5 3 5 7 5 4 5 2	8	4.50	1.512	1.6532E-02	6.5298E-02
9	-0 0 5 4 5 5 4 3 4 3	8	4.13	.835	2.3759E-02	4.1000E-02
10	-0 0 3 3 4 3 3 3 3 4	8	3.25	.463	2.2545E-02	1.4953E-02
11	-0 0 2 3 3 3 3 2 3 2	8	2.63	.518	3.2226E-02	1.1278E-02
12	-0 0 3 3 3 4 3 3 3 3	8	3.13	.354	6.6443E-02	8.8242E-03
13	-0 0 4 4 5 4 4 3 5 2	8	3.88	.991	1.3356E-01	1.0121E-02
14	-0 0 3 3 4 3 3 2 4 3	8	3.13	.641	5.3088E-02	8.4343E-03
15	-0 0 4 3 4 4 4 3 3 3	8	3.50	.535	1.0842E-01	1.1192E-02
16	-0 0 4 2 4 3 3 3 3 2	8	3.00	.756	8.1208E-02	8.8032E-03
17	-0 0 4 3 6 4 4 4 3 2	8	3.75	1.165	1.3158E-01	6.0543E-03
18	-0 0 2 3 3 3 3 2 3 3	8	2.75	.463	5.4269E-02	6.4500E-03
19	-0 0 3 3 5 3 4 3 3 2	8	3.25	.886	1.0711E-01	9.0168E-03
20	-0 0 2 3 3 2 3 2 2 2	8	2.38	.518	3.4588E-02	6.9959E-03

TIFS FLIGHT 355 TDT 13 INSTRUMENTATION PEMS I DATE 9-14-74

SEGMENT	SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (S) (RMS G)	TRANS (S) (RMS G)
	SUBJ	0	23	7	13	25	4	8	15	30	20	N	MEAN	STD DEV		
1		-0	1	3	2	3	3	2	2	3	2	9	2.33	.707	1.46[illegible]2E-02	1.47[illegible]3E-02
2		-0	2	3	4	5	5	4	3	5	4	9	3.89	1.054	1.54[illegible]6E-02	5.2390E-02
3		-0	2	2	3	5	4	2	2	5	3	9	3.11	1.269	1.77[illegible]7E-02	2.6814E-02
4		-0	3	4	4	6	6	4	3	6	4	9	4.44	1.236	1.81[illegible]6E-02	6.4382E-02
5		-0	3	4	3	5	4	3	2	5	3	9	3.56	1.014	1.60[illegible]6E-02	4.1269E-02
6		-0	-0	4	4	5	5	5	3	5	4	8	4.38	.744	1.55[illegible]3E-02	5.2993E-02
7		-0	-0	4	3	4	4	3	2	4	2	8	3.25	.886	1.97[illegible]7E-02	2.8665E-02
8		-0	-0	5	3	5	7	5	4	5	2	8	4.50	1.512	1.65[illegible]2E-02	6.5298E-02
9		-0	-0	5	4	5	5	4	3	4	3	8	4.13	.835	2.37[illegible]9E-02	4.1000E-02
10		-0	-0	3	3	4	3	3	3	3	4	8	3.25	.463	2.25[illegible]5E-02	1.4953E-02
11		-0	-0	2	3	3	3	3	2	3	2	8	2.63	.518	3.22[illegible]6E-02	1.1278E-02
12		-0	-0	3	3	3	4	3	3	3	3	8	3.13	.354	6.64[illegible]3E-02	8.8242E-03
13		-0	-0	4	4	5	4	4	3	5	2	8	3.88	.991	1.33[illegible]6E-01	1.0121E-02
14		-0	-0	3	3	4	3	3	2	4	3	8	3.13	.641	5.30[illegible]8E-02	8.4343E-03
15		-0	-0	4	3	4	4	4	3	3	3	8	3.50	.535	1.06[illegible]2E-01	1.1192E-02
16		-0	2	4	2	4	3	3	3	3	2	9	2.89	.782	8.12[illegible]8E-02	8.8032E-03
17		-0	2	4	3	6	4	4	4	3	2	9	3.56	1.236	1.31[illegible]8E-01	6.0543E-03
18		-0	1	2	3	3	3	3	2	3	3	9	2.56	.726	5.42[illegible]9E-02	6.4530E-03
19		-0	1	3	3	5	3	4	3	3	2	9	3.00	1.118	1.07[illegible]1E-01	9.0168E-03
20		-0	1	2	3	3	2	3	2	2	2	9	2.22	.667	3.45[illegible]8E-02	6.9959E-03

TIFS FLIGHT 356 TDT 16 INSTRUMENTATION PEMS II DATE 9-16-74

SEGMENT	SEAT / SUBJ	1 / 28	2 / 4	3 / 19	4 / 7	5 / 14	6 / 8	7 / 9	8 / 15	9 / 3	10 / 12	RESPONSE N	MEAN	STD DEV	VERT (S) (RMS G)	TRANS (S) (RMS G)
1		5	5	2	3	2	3	6	5	5	4	10	4.00	1.414	4.2122E-02	9.3096E-02
2		5	6	3	5	3	4	6	5	6	4	10	4.70	1.160	1.3333E-01	9.2563E-02
3		5	6	3	5	3	3	6	4	5	4	10	4.40	1.174	6.9456E-02	9.4180E-02
4		5	7	4	6	4	5	6	5	6	4	10	5.20	1.033	1.6579E-01	9.5299E-02
5		5	6	3	5	4	4	6	4	6	4	10	4.70	1.059	1.0074E-01	9.5279E-02
6		5	6	3	5	5	4	5	4	6	3	10	4.60	1.075	1.3379E-01	9.5561E-02
7		5	6	3	5	5	4	5	5	6	4	10	4.80	.919	7.3429E-02	9.6637E-02
8		5	7	5	5	5	5	6	5	6	3	10	5.20	1.033	1.6851E-01	9.5951E-02
9		5	7	4	5	6	4	5	5	5	3	10	4.90	1.101	1.0196E-01	9.5998E-02
10		5	7	5	4	6	4	5	4	6	4	10	5.00	1.054	3.7818E-02	9.6273E-02
11		4	3	2	2	4	3	4	3	3	2	10	3.00	.816	2.0759E-02	2.2840E-02
12		4	3	2	2	4	3	4	3	4	2	10	3.10	.876	5.9558E-02	2.1818E-02
13		5	4	2	2	4	4	5	4	4	3	10	3.70	1.059	1.0477E-01	2.1994E-02
14		5	4	1	3	4	2	5	3	4	2	10	3.30	1.337	4.5551E-02	2.2750E-02
15		5	5	2	3	3	3	5	3	4	2	10	3.50	1.179	8.5191E-02	2.2866E-02
16		5	4	2	2	3	4	5	2	4	2	10	3.30	1.252	6.7842E-02	2.3683E-02
17		5	5	2	4	4	5	5	3	5	3	10	4.10	1.101	1.1049E-01	2.2520E-02
18		5	3	3	3	3	4	4	3	4	2	10	3.40	.843	4.4180E-02	2.3084E-02
19		5	4	3	4	3	3	4	3	4	2	10	3.50	.850	8.6450E-02	2.2780E-02
20		4	4	3	3	2	3	4	3	3	2	10	3.10	.738	2.5617E-02	2.2424E-02

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SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (R)
SEGMENT	SUBJ	28	12	8	14	15	19	7	4	9	3	N	MEAN	STD DEV	(RMS G)
1		2	2	2	1	2	2	2	2	3	2	10	2.00	.471	.0
2		3	3	3	2	2	3	5	3	4	3	10	3.10	.876	.0
3		2	2	2	2	2	2	3	2	3	2	10	2.20	.422	2.6881E-02
4		2	3	2	2	2	2	2	2	4	2	10	2.30	.675	6.6915E-02
5		4	3	3	3	3	2	5	4	5	3	10	3.50	.972	.0
6		3	2	2	3	2	2	2	2	3	2	10	2.30	.483	.0
7		2	2	2	2	2	1	4	2	4	3	10	2.40	.966	7.1477E-02
8		2	4	3	3	3	5	5	4	6	4	10	3.90	1.197	1.2634E-01
9		2	2	2	3	2	2	5	2	3	2	10	2.50	.972	2.8234E-02
10		3	3	3	2	2	4	5	3	5	3	10	3.30	1.059	9.8804E-02
11		3	3	3	3	3	5	6	5	6	4	10	4.10	1.287	1.2416E-01
12		3	4	3	2	2	4	5	2	4	2	10	3.10	1.101	3.5422E-02
13		5	4	4	3	4	3	6	6	6	4	10	4.50	1.179	1.5130E-01
14		4	3	3	4	3	2	5	4	5	3	10	3.60	.966	8.8559E-02
15		4	3	3	3	2	2	5	2	4	2	10	3.00	1.054	6.2379E-02
16		5	3	4	5	4	2	6	5	6	4	10	4.40	1.265	1.4216E-01
17		5	3	3	4	3	2	6	4	4	3	10	3.70	1.160	9.2416E-02
18		4	2	3	4	2	2	5	2	4	2	10	3.00	1.155	5.0255E-02
19		5	2	3	5	2	5	5	3	5	4	10	3.90	1.287	1.1523E-01
20		4	3	3	5	2	3	5	2	3	3	10	3.30	1.059	6.8323E-02

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SEGMENT	SEAT 1 / SUBJ 28	2 / 12	3 / 8	4 / 14	5 / 15	6 / 19	7 / 7	8 / 4	9 / 9	10 / 3	RESPONSE N	MEAN	STD DEV	VERT (R) (RMS G)
1	2	2	2	1	2	2	0	2	3	2	9	2.00	.500	.0
2	3	3	3	2	2	3	0	3	4	3	9	2.89	.601	.0
3	2	2	2	2	2	2	0	2	3	2	9	2.11	.333	2.6841E-02
4	2	3	2	2	2	2	0	2	4	2	9	2.33	.707	6.6915E-02
5	4	3	3	3	3	2	0	4	5	3	9	3.33	.866	.0
6	3	2	2	3	2	2	0	2	3	2	9	2.33	.500	.0
7	2	2	2	2	2	1	0	2	4	3	9	2.22	.833	7.1477E-02
8	2	4	3	3	3	5	0	4	6	4	9	3.78	1.202	1.2694E-01
9	2	2	2	3	2	2	0	2	3	2	9	2.22	.441	2.8234E-02
10	3	3	3	2	2	4	0	3	5	3	9	3.11	.928	9.8844E-02
11	3	3	3	3	3	5	0	5	6	4	9	3.89	1.167	1.2416E-01
12	3	4	3	2	2	4	0	2	4	2	9	2.89	.928	3.5422E-02
13	5	4	4	3	4	3	0	5	6	4	9	4.33	1.118	1.5130E-01
14	4	3	3	4	3	2	0	4	5	3	9	3.44	.882	8.8569E-02
15	4	3	3	3	2	2	0	2	4	2	9	2.78	.833	6.2379E-02
16	5	3	4	5	4	2	0	5	6	4	9	4.22	1.202	1.4216E-01
17	5	3	3	4	3	2	0	4	4	3	9	3.44	.882	9.2416E-02
18	4	2	3	4	2	2	0	2	4	2	9	2.78	.972	5.0295E-02
19	5	2	3	5	2	5	0	3	5	4	9	3.78	1.302	1.1523E-01
20	4	3	3	5	2	3	0	2	3	3	9	3.11	.928	6.8323E-02

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	SEAT	1	2	3	4	5	6	7	8	9	10	R E S P O N S E			ROLL (R)	YAW (R)
SEGMENT	SUBJ	14	15	20	34	8	33	32	19	7	31	N	MEAN	STD DEV	RMS RAD/S	RMS RAD/S
1		2	2	2	5	2	2	2	1	2	4	10	2.40	1.174	1.48[illegible]2E-02	5.1402E-03
2		2	2	2	3	2	2	4	2	2	5	10	2.60	1.075	4.27[illegible]6E-03	1.0238E-02
3		-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	0	.00	.000	.0	.0
4		2	3	1	3	2	2	2	2	3	4	10	2.40	.843	3.46[illegible]8E-03	5.4756E-03
5		2	2	2	3	2	2	2	2	3	4	10	2.40	.699	6.65[illegible]5E-03	9.6347E-03
6		2	3	1	3	2	2	2	2	3	3	10	2.30	.675	2.79[illegible]7E-03	3.8419E-03
7		2	2	-0	3	2	2	2	2	3	4	9	2.44	.726	4.09[illegible]0E-03	1.0515E-02
8		2	3	-0	3	2	1	2	3	2	2	9	2.22	.667	1.55[illegible]5E-02	3.5488E-03
9		2	3	-0	3	2	2	2	2	4	2	9	2.44	.726	1.07[illegible]9E-02	7.3541E-03
10		3	3	-0	3	3	2	4	2	3	2	9	2.78	.667	1.17[illegible]5E-02	6.7188E-03
11		3	3	2	4	3	1	4	2	2	2	10	2.60	.966	1.84[illegible]0E-02	1.6342E-02
12		4	3	3	3	3	4	5	2	3	4	10	3.40	.843	3.85[illegible]6E-02	2.5891E-03
13		4	3	3	5	3	2	3	3	2	3	10	3.10	.876	8.25[illegible]3E-03	1.7965E-03
14		4	4	2	5	3	3	3	2	3	2	10	3.10	.994	2.76[illegible]8E-02	2.8913E-03
15		4	3	2	4	3	2	3	2	4	3	10	3.00	.816	1.52[illegible]5E-02	1.8861E-03
16		3	5	3	5	4	3	4	2	4	5	10	3.80	1.033	3.81[illegible]5E-02	7.8107E-03
17		4	4	4	4	3	1	2	2	3	2	10	2.90	1.101	2.57[illegible]1E-02	2.2582E-03
18		4	4	3	3	3	3	3	2	2	3	10	3.00	.667	3.53[illegible]1E-02	2.8963E-03
19		4	3	2	3	2	3	2	3	3	2	10	2.70	.675	2.34[illegible]2E-02	1.0242E-02
20		4	4	2	3	2	2	3	2	3	2	10	2.70	.823	1.67[illegible]7E-02	4.5056E-03

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SEGMENT	SEAT / SUBJ	1 / 19	2 / 7	3 / 31	4 / 33	5 / 15	6 / 20	7 / 8	8 / 14	9 / 32	10 / 34	RESPONSE N	MEAN	STD DEV	VERT (R) (RMS G)	TRANS (R) (RMS G)
1		2	3	4	2	3	3	3	2	0	0	8	2.75	.707	6.0996E-02	2.4957E-02
2		3	4	4	3	4	5	3	3	0	0	8	3.63	.744	6.4507E-02	4.7347E-02
3		2	4	3	3	3	3	3	3	0	0	8	3.00	.535	5.7969E-02	1.3818E-02
4		3	4	3	4	4	4	4	3	0	0	8	3.63	.518	5.9355E-02	4.1598E-02
5		5	5	6	5	4	5	5	3	0	0	8	4.75	.886	6.3155E-02	7.1206E-02
6		4	5	3	4	3	4	4	3	0	0	8	3.75	.707	6.4245E-02	2.5873E-02
7		5	5	4	3	3	5	4	4	0	0	8	4.13	.835	6.4858E-02	3.6267E-02
8		4	6	5	5	4	5	5	4	0	0	8	4.75	.707	6.2288E-02	6.4653E-02
9		3	5	4	4	3	3	4	5	0	0	8	3.88	.835	6.1701E-02	1.6595E-02
10		5	6	3	4	3	3	5	5	0	0	8	4.25	1.165	6.6504E-02	5.0477E-02
11		4	6	4	4	4	4	5	4	0	0	8	4.38	.744	3.7208E-02	4.4850E-02
12		3	5	2	2	3	2	4	4	0	0	8	3.13	1.126	3.1424E-02	1.5723E-02
13		5	6	5	4	4	4	4	5	0	0	8	4.63	.744	3.6082E-02	6.0358E-02
14		4	4	4	4	3	3	5	4	0	0	8	3.88	.641	4.0717E-02	4.0766E-02
15		4	5	4	3	3	3	4	4	0	0	8	3.75	.707	3.6576E-02	3.1334E-02
16		5	5	5	4	4	4	4	4	0	0	8	4.38	.518	3.4360E-02	6.6197E-02
17		4	4	4	3	3	-0	4	4	0	0	7	3.71	.488	3.4891E-02	4.1212E-02
18		4	3	2	2	3	-0	4	4	0	0	7	3.14	.900	3.7358E-02	1.6495E-02
19		5	4	5	4	4	-0	5	4	0	0	7	4.43	.535	3.6959E-02	5.0612E-02
20		4	4	4	4	3	-0	4	4	0	0	7	3.86	.378	4.6118E-02	2.0542E-02

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	SEAT	1	2	3	4	5	6	7	8	9	10	RESPONSE			VERT (R)	TRANS (R)
SEGMENT	SUBJ	19	7	31	33	15	20	8	14	32	34	N	MEAN	STD DEV	(RMS G)	(RMS G)
1		2	3	4	2	3	3	3	2	3	3	10	2.80	.632	6.0996E-02	2.4957E-02
2		3	4	4	3	4	5	3	3	5	6	10	4.00	1.054	6.457E-02	4.7347E-02
3		2	4	3	3	3	3	3	3	5	5	10	3.40	.966	5.795 5E-02	1.3818E-02
4		3	4	3	4	4	4	4	3	5	4	10	3.80	.632	5.935 5E-02	4.1598E-02
5		5	5	6	5	4	5	5	3	7	7	10	5.20	1.229	6.315 5E-02	7.1206E-02
6		4	5	3	4	3	4	4	3	6	5	10	4.10	.994	6.424 5E-02	2.5873E-02
7		5	5	4	3	3	5	4	4	5	6	10	4.40	.966	6.485 8E-02	3.6267E-02
8		4	6	5	5	4	5	5	4	7	5	10	5.00	.943	6.223 8E-02	6.4653E-02
9		3	5	4	4	3	3	4	5	6	7	10	4.40	1.350	6.17. 1E-02	1.6595E-02
10		5	6	3	4	3	3	5	5	6	6	10	4.60	1.265	6.65 4E-02	5.0477E-02
11		4	6	4	4	4	4	5	4	6	7	10	4.80	1.135	3.72. 8E-02	4.4850E-02
12		3	5	2	2	3	2	4	4	4	6	10	3.50	1.354	3.142 4E-02	1.5723E-02
13		5	6	5	4	4	4	4	5	7	7	10	5.10	1.197	3.603 2E-02	6.0358E-02
14		4	4	4	4	3	3	5	4	5	6	10	4.20	.919	4.371 7E-02	4.0766E-02
15		4	5	4	3	3	3	4	4	4	6	10	4.00	.943	3.657 6E-02	3.1334E-02
16		5	5	5	4	4	4	4	4	7	7	10	4.90	1.197	3.435 0E-02	6.6197E-02
17		4	4	4	3	3	-0	4	4	6	6	9	4.22	1.093	3.489 1E-02	4.1212E-02
18		4	3	2	2	3	-0	4	4	4	6	9	3.56	1.236	3.735 8E-02	1.6495E-02
19		5	4	5	4	4	-0	5	4	6	6	9	4.78	.833	3.695 9E-02	5.6612E-02
20		4	4	4	4	3	-0	4	4	7	7	9	4.56	1.424	4.611 8E-02	2.0542E-02

APPENDIX B

SUBJECT BACKGROUND AND COMFORT SCALE INTERPRETATION

Subject Code: 3

Occupation: Employee, NASA-LRC
Age; Sex: 38; male

Total flight experiences: 1000+
Flights in last 2 years: 100+
Types of aircraft flown: small aircraft - 100+
commercial airline - 4 to 5
Attitude towards flying: Flying is a means of transportation. I would rather fly than drive or ride on trains or other ground transportation because it is faster. For the same time interval, flying is less tiring.

Interpretation of comfort scale:

1 - Very comfortable
2 - Comfortable
3 - Somewhat comfortable
4 - Neutral
5 - Somewhat uncomfortable
6 - Uncomfortable
7 - Very uncomfortable

Subject Code: 4

Occupation: Employee, NASA-LRC

Age; Sex: 27; male

Total flight experiences: 50

Flights in last 2 years: 10 flights commercial, 20 flights research, all seasons, mixed weather

Types of aircraft flown: commercial jet, prop, and helicopter

Attitude towards flying: I absolutely love flying, have seldom felt anxious while flying, and have never been motion sick.

Interpretation of comfort scale:

1 - Very comfortable: armchair, feet by the fire.

2 - Comfortable: only occasional perception of extraneous stimulus, but comforting break in monotony.

3 - Somewhat comfortable: same as 2.

4 - Neutral: stimulus definitely perceived, but not distracting.

5 - Somewhat uncomfortable: stimulus distracts from desired activity.

6 - Uncomfortable: stimulus makes desired activity difficult.

7 - Very uncomfortable: forget any desired activity, apprehensive (safety) and/or stimulus--fatigued.

Subject Code: 5

Occupation: Professor, UVA

Age; Sex: 32; male

Total flight experiences: 100 to 200

Flights in last 2 years: 40 to 50

Types of aircraft flown: prop, jet, helicopter, propjet, etc.

Attitude towards flying: Good

Interpretation of comfort scale:

1 - Very comfortable

2 - Comfortable

3 - Somewhat comfortable

4 - Neutral

5 - Somewhat uncomfortable

6 - Uncomfortable

7 - Very uncomfortable

Subject Code: 7

Occupation: Research Assistant, UVA

Age; Sex: 24; male

Total flight experiences: 15 to 20

Flights in last 2 years: twice a year, mostly summer

Types of aircraft flown: mostly commercial, have also flown in light planes and helicopters

Attitude towards flying: In general I like to fly, preferably during good weather.

Interpretation of comfort scale:

1 - Very comfortable: where the motion is soothing and I can hardly feel it. Everything is at the right level.

2 - Comfortable: where one begins to perceive all the changes from optimum level.

3 - Somewhat comfortable: I would rather name it as "barely comfortable." All modes can be perceived very clearly.

4 - Neutral: This is the level beyond which I would not like to go through an entire flight without getting tired.

5 - Somewhat uncomfortable: If I try, I will be able to tolerate this over a flight without getting upset or tired.

6 - Uncomfortable: I may tolerate this with a maximum of 10-15% of the flight time, but would have an effect on me afterwards.

7 - Very uncomfortable: No way would I like to go through this. Only spurts of this can be tolerated, no more.

Subject Code: 8

Occupation: Employee, UVA
Age; Sex: 35; female

Total flight experiences: 60 to 100
Flights in last 2 years: 20 (all above in last 15 years)
Types of aircraft flown: mostly commercial, some general aviation, some simulators, B-707, 737, 747, YS-11, Cessna, Piper
Attitude towards flying: Love flying!

Interpretation of comfort scale:

1 - Very comfortable: no perceptable motion, little noise, vibration slight, if any; temperature comfortable.
2 - Comfortable: slight motion, environmental conditions agreeable.
3 - Somewhat comfortable: motion increase, able to perform activities, temperature or noise bothersome.
4 - Neutral: not comfortable or uncomfortable, beginning to have difficulty performing activities.
5 - Somewhat uncomfortable: definite motion, unable to write or read.
6 - Uncomfortable: as close to unhappy as you can get without feeling sick.
7 - Very uncomfortable: miserable, airsick.

Subject Code: 9

Occupation: Employee, NASA-LRC
Age; Sex: 32; male

Total flight experiences: 200 hours
Flights in last 2 years: helicopter, 3 hours; general aviation, 4 or 5 hours; commercial, 40 hours
Types of aircraft flown: helicopter, general aviation, commercial
Attitude towards flying: Ratings 1, 2, and 3 were seldom used. I can never take aircraft flight that lightly.

Interpretation of comfort scale:

1 - Very comfortable: impossible dream.
2 - Comfortable: never in an airplane.
3 - Somewhat comfortable: exceptionally smooth flight.
4 - Neutral: satisfactory (normal airplane cruise).
5 - Somewhat uncomfortable: slightly rough air.
6 - Uncomfortable: rough air/rapid descents (tense, anxious).
7 - Very uncomfortable: very anxious/concerned for safety of aircraft.

Subject Code: 12

Occupation: Research Assistant, UVA
Age; Sex: 36; male

Total flight experiences: 3,000+
Flights in last 2 years: 60
Types of aircraft flown: Piper, J3, Cherokee; Beech, T34, TC45J; Cessna, 150, 172, 207; TA4F, TF7J, AF9J, F11, F2, T28, A4E, A4C, A4B, C117, C130, commercial
Attitude towards flying: Love it! Subject 12 is a rated pilot.

Interpretation of comfort scale:

1 - Very comfortable: comfortable environment, temperature @ 70, seated in a comfortable seat, i.e., sitting in living room watching TV.

2 - Comfortable: lack of unpleasant noise or vibration, reasonable temperature, able to walk around easily, able to read/work easily.

3 - Somewhat comfortable: lack of obnoxious levels of vibration, should be able to sleep or carry on reasonab e activity without too many distractions.

4 - Neutral: indifference point, wish it was better but can still carry on normal activity such as sleep, relax, read, without too much distraction.

5 - Somewhat uncomfortable: becoming difficult to maintain conversation, could still rest or sleep, becoming annoyed.

6 - Uncomfortable: if sleeping, would occasionally wake up (I'd be woken up abruptly). Hard to read, to concentrate, would be difficult to walk around.

7 - Very uncomfortable: worried about vehicle coming apart, impossible to walk around.

Subject Code: 13

Occupation: Research Assistant, UVA
Age; Sex: 22; male

Total flight experiences: 200 to 300
Flights in last 2 years: 100 hours past 4 years in private aircraft, 4 flights per year past 4 years on military space-available flights
Types of aircraft flown: 100 hours PA-28-140; 10 to 15 hours Cessna 172, T34; 50 to 75 hours C-118, C-131; 2 hours T33; rest of flights on commercial aircraft
Attitude towards flying: Love it!

Subject 13 is a rated pilot.

Interpretation of comfort scale:

1 - Very comfortable: straight and level flight, comfortable temperature, no sharp changes in motion.
2 - Comfortable: straight and level flight, tolerable temperatures, moderate changes in motion allowable.
3 - Somewhat comfortable: straight and level flight, tolerable temperatures, somewhat bumpy, however reading or writing could still be done reasonably well.
4 - Neutral: climbs, turns, large bumps, difficult reading, however still possible.
5 - Somewhat uncomfortable: cannot read, cannot sleep because of motion.
6 - Uncomfortable: feeling sick to stomach.
7 - Very uncomfortable: feeling as if ready to throw-up.

Subject Code: 14

Occupation: Research Assistant, UVA
Age; Sex: 23; female

Total flight experiences: Approximately 30
Flights in last 2 years: 24
Types of aircraft flown: 737, 727, DC-9, YS-11, Piper Cub, Cessna 207
Attitude towards flying: Love flying.

Interpretation of comfort scale:

1 - Very comfortable: as comfortable as I would be in a chair at home.
2 - Comfortable: noise, temperature, pressure, etc., not at optimum but not annoying.
3 - Somewhat comfortable: some motion, temperature, pressure, etc., irritating but not to any extreme.
4 - Neutral: beginning to have some physical discomfort, annoyance.
5 - Somewhat uncomfortable: queasy stomach, but not too upsetting.
6 - Uncomfortable: near to airsick, headache--on the verge.
7 - Very uncomfortable: vomiting, etc.

Subject Code: 15

Occupation: Research Assistant, UVA
Age; Sex: 25; male

Total flight experiences: 50 to 100
Flights in last 2 years: most flights have occurred during last four years
Types of aircraft flown: mostly jet airlines, 727, 707, DC9, DC10, 737, Electra, F27; 20 to 30 flights on USAF C135, C118, T29; 10 flights on general aviation airplanes
Attitude towards flying: Love it.

Interpretation of comfort scale:

1 - Very comfortable: no motion at all, smooth, can rest, write or sit with no obstruction.
2 - Comfortable: a few small bumps, but still no problem doing anything.
3 - Somewhat comfortable: a few annoying parts, cannot rest my head on my hand without it bumping off occasionally, sometimes too cold.
4 - Neutral: not good, but not really annoying either.
5 - Somewhat uncomfortable: starting to move me around or out of my seat, could put up with it for awhile though, also when it is too hot and I feel sticky.
6 - Uncomfortable: getting really knocked around, maybe begin to feel a little nausea or stuff bouncing around in my stomach.
7 - Very uncomfortable: bad news, let me off the plane.

Subject Code: 19

Occupation: Work/Study Student, NASA-LRC
Age; Sex: 20; female

Total flight experiences: 35
Flights in last 2 years: 20
Types of aircraft flown: DC-9, DC-10, 737, turbo-prop
Attitude towards flying: Enjoy it.

Interpretation of comfort scale:

1 - Very comfortable: all conditions perfect--confident.
2 - Comfortable: all conditions O.K. except one or two small things (like noise)--confident but bothered.
3 - Somewhat comfortable: general motion O.K. except maybe temperature is bad or headache--confident but annoyed.
4 - Neutral: don't really feel O.K. or bad--O.K.
5 - Somewhat uncomfortable: possibly motion disturbed me a little--feel "strained".
6 - Uncomfortable: feel queasy--perspire.
7 - Very uncomfortable: feel sick enough to stop flight--sick.

Subject Code: 20

Occupation: Student, Hampton Institute
Age; Sex: 30; female

Total flight experiences: 25 to 40
Flights in last 2 years: I've flown in all seasons several times a year for 6 or 7 years, but not very much in the past 2 years, only 2 or 3 times recently.
Types of aircraft flown: jets mainly and propjets about twice
Attitude towards flying: I love to fly!

Interpretation of comfort scale:

1 - Very comfortable: I would have to be in a very positive state of mind. Temperature would be cool and pleasant, plane motion should be at minimum, lightly rolling, sort of gliding or rocking.
2 - Comfortable: same general temperature, but could allow for some deviation--pleasant state of mind, plane motion can vary to a variety of motions, but not too sharply.
3 - Somewhat comfortable: more variations in temperature and plane motion but nothing that would make me feel uneasy.
4 - Neutral: I feel uncertain about this rating; basically indifference.
5 - Somewhat uncomfortable: experiencing minor discomforts but they can be tolerated.
6 - Uncomfortable: feeling bad generally or extreme temperature change.
7 - Very uncomfortable: motion sickness and/or very bad motion.

Subject Code: 21

Occupation:

Age; Sex: 21; male

Total flight experiences: 1

Flights in last 2 years: 1

Types of aircraft flown: commercial 727

Attitude towards flying: I like it.

Interpretation of comfort scale:

1 - Very comfortable: no stomach discomfort, cool and dry body.

2 - Comfortable: no stomach discomfort, temperature not exactly the way I'd like it.

3 - Somewhat comfortable: no stomach discomfort, distracting motions of aircraft, temperature not perfect.

4 - Neutral: bordering on stomach discomfort but not quite, temperature not perfect, distracting aircraft motions.

5 - Somewhat uncomfortable: first feelings of sickness, usually extreme case of the butterflies.

6 - Uncomfortable: feel a little sick and perhaps quite tense.

7 - Very uncomfortable: feel sick and might regurgitate.

Subject Code: 22

Occupation: Employee, Hampton Institute
Age; Sex: 23; female

Total flight experiences: 12 to 15
Flights in last 2 years: I have flown approximately 5 times
Types of aircraft flown: commercial at all times (Delta, Boeing 707)
Attitude towards flying: I enjoy flying very much. My trips were long-term in that I was on the plane for 3-4 consecutive hours. The rides were very smooth.

Interpretation of comfort scale:

1 - Very comfortable: relaxed, no physical agitation, no discomfort.
2 - Comfortable: no physical agitation or discomfort.
3 - Somewhat comfortable: slightly agitating but not totally agitating.
4 - Neutral: neither one way nor the other, undecided.
5 - Somewhat uncomfortable: physically agitating, but not nauseating.
6 - Uncomfortable: not relaxed, physical agitation, slightly nauseating and prompting dizziness.
7 - Very comfortable: totally tense, total physical agitation, nauseating and dizzy feeling.

Subject Code: 23

Occupation: Employee, Hampton Institute
Age; Sex: 30; male

Total flight experiences:
Flights in last 2 years: every other weekend during 1968, few times since
Types of aircraft flown: general aviation, commercial DC8
Attitude towards flying: Love it!

Interpretation of comfort scale:

1 - Very comfortable: everything is all right.
2 - Comfortable: everything is all right except one or two things.
3 - Somewhat comfortable: a little change from 2 but not much.
4 - Neutral: no feeling.
5 - Somewhat uncomfortable: a change in the ride or temperature that makes me change my seat setting.
6 - Uncomfortable: a little more change to the downward side, I am starting to think more of getting out.
7 - Very uncomfortable: I wish I was on the ground.

Subject Code: 24

Occupation: Work/Study Student, NASA-LRC
Age; Sex: 20; female

Total flight experiences: 7
Flights in last 2 years: all since January 1974, about once every other month
Types of aircraft flown: commercial 6 times; 2 times BAC-fanjet; 4 times DC9; general aviation, 1 time, Cessna 4 seats
Attitude towards flying: I love flying!

Interpretation of comfort scale:

1 - Very comfortable: motion not at all annoying, neither hardly noticeable or unenjoyable, no noticeable pressure changes, no smoke, very slightly cool temperature, noise not much more excessive than it normally is on TIFS.

2 - Comfortable: motion not annoying, very little noticeable pressure change, very little smoke, temperature could be a little cooler or warmer than I prefer, but not much, noise slightly more excessive than normal.

3 - Somewhat comfortable: motion not annoying for a short period, but might be for a long period, temperature much warmer or colder than I prefer; I don't base my answers too terribly much on temperature but I'd rather be a little cooler than too warm, noise very excessive, pressure change noticeable, but not hurting ears.

4 - Neutral: pressure change noticeable, but not hurting ears, don't really notice temperature, noise or motion.

5 - Somewhat uncomfortable: about the same as 3 except motion slightly annoying and possibly very annoying if it lasted too long, pressure hurting ears.

6 - Uncomfortable: motion annoying, pressure constantly annoying, temperature really hot, hard to breathe.

7 - Very uncomfortable: if I ever got to this point, I'd probably be asking you to reduce the gain, feeling motion sickness almost to the point of actually being sick or constant pain due to pressure.

Subject Code: 25

Occupation:

Age; Sex: 20; female

Total flight experiences: no flights prior to today

Flights in last 2 years: none

Types of aircraft flown: nine

Attitude towards flying: The flights were more enjoyable than I had anticipated. I had expected to be frightened, however I felt very at ease.

Interpretation of comfort scale:

1 - Very comfortable: according to my flight history, I have no accurate judgment (I did not use these).

2 - Comfortable: same as above.

3 - Somewhat comfortable: I'm enjoying the flight.

4 - Neutral: Okay; nothing wrong.

5 - Somewhat uncomfortable: feeling rather shakey.

6 - Uncomfortable: on the verge of nausea.

7 - Very uncomfortable: ill.

Subject Code: 26

Occupation:

Age; Sex: 19; female

Total flight experiences: 1

Flights in last 2 years: 0

Types of aircraft flown: commercial

Attitude towards flying: I enjoy flying but am sort of skeptical because of the motions of the plane which sometime causes uncomfortable feelings (nausea).

Interpretation of comfort scale:

1 - Very comfortable: ride was comfortable, no problems.
2 - Comfortable: ride fairly comfortable.
3 - Somewhat comfortable: slight discomfort, noticed movement of plane.
4 - Neutral: discomfort.
5 - Somewhat uncomfortable: beginning to feel uncomfortable (physical).
6 - Uncomfortable: nausea.
7 - Very uncomfortable: unbearable.

Subject Code: 27

Occupation:

Age; Sex: 20; female

Total flight experiences: 3 flights (besides these today)
Flights in last 2 years: no flights in past 2 years
Types of aircraft flown: commercial planes
Attitude towards flying: Love flying, but not in a simulator!

Interpretation of comfort scale:

1 - Very comfortable: extremely comfortable (like sleeping in a bed).
2 - Comfortable: feeling fine.
3 - Somewhat comfortable: Okay.
4 - Neutral: something is out of place somewhere!
5 - Somewhat uncomfortable: just a little uncomfortable.
6 - Uncomfortable: extremely uncomfortable to me.
7 - Very uncomfortable: ready to quit!!!

Subject Code: 28

Occupation:

Age; Sex: 20; male

Total flight experiences: 10

Flights in last 2 years: 10

Types of aircraft flown: commercial

Attitude towards flying: I like flying.

Interpretation of comfort scale:

1 - Very comfortable: means nothing at all in the flight is bothering me.

2 - Comfortable: means hardly anything at all is wrong.

3 - Somewhat comfortable: being moved about by the flight but there is not enough action to cause me to feel it.

4 - Neutral: discomfort but not a whole lot of it.

5 - Somewhat uncomfortable: discomfort enough so I start to feel it.

6 - Uncomfortable: I'm beginning to hurt.

7 - Very uncomfortable: I'm sick.

Subject Code: 29

Occupation: Housewife/Teacher

Age; Sex: 25; female

Total flight experiences: 25

Flights in last 2 years: 20

Types of aircraft flown: commercial

Attitude towards flying: I really enjoyed the opportunity to fly in the project. The first part of the flight was great. The second flight was interesting in finding what levels of motion affect me.

Interpretation of comfort scale:

1 - Very comfortable: very smooth, no noticeable disturbance.

2 - Comfortable: very few bumps.

3 - Somewhat comfortable: some bumps.

4 - Neutral: middle of the road.

5 - Somewhat uncomfortable: slightly uncomfortable.

6 - Uncomfortable: making me aware of uncomfortable movements.

7 - Very uncomfortable: makes me sick.

Subject Code: 30

Occupation:

Age; Sex: 34; female

Total flight experiences: 10

Flights in last 2 years: 3

Types of aircraft flown: commercial

Attitude towards flying: I enjoy flying. I have no complaints at all.

Interpretation of comfort scale:

1 - Very comfortable: very comfortable without any flaws.

2 - Comfortable: maybe a dip here and there.

3 - Somewhat comfortable: temperature, writing possible, smoothness of ride.

4 - Neutral: more or less OK, maybe the noise could be a bit distracting.

5 - Somewhat uncomfortable: noise, sudden dips, turbulence, wind.

6 - Uncomfortable: too many rocky motions, and again sudden dips.

7 - Very uncomfortable: could be completely out of sorts, which I have not experienced yet.

Subject Code: 31

Occupation:

Age; Sex: 18; female

Total flight experiences: None

Flights in last 2 years: None

Types of aircraft flown: None

Attitude towards flying: Very anxious to fly.

Interpretation of comfort scale:

1 - Very comfortable: feeling completely at ease and really being unaware of the fact that I am flying--temperature just right, motion smooth.

2 - Comfortable: feeling at ease but somewhat aware of the fact that I am flying--temperature O.K.

3 - Somewhat comfortable: feeling rested but not completely at ease--temperature either slightly too cool or warm.

4 - Neutral: neither comfortable nor uncomfortable.

5 - Somewhat uncomfortable: feeling slightly rested but not at ease, motion varying too much.

6 - Uncomfortable: feeling sick and uptight, too cool or warm.

7 - Very uncomfortable: miserable, sharp jolts, too cold or hot.

Subject Code: 32

Occupation:

Age; Sex: 21; female

Total flight experiences: 1

Flights in last 2 years: 0

Types of aircraft flown: commercial

Attitude towards flying: It's all right.

Interpretation of comfort scale:

1 - Very comfortable: no annoying noises, motions, etc.

2 - Comfortable: minimal annoyances.

3 - Somewhat comfortable: a few annoying sounds, motions.

4 - Neutral: not quite comfortable, but not really uncomfortable.

5 - Somewhat uncomfortable: slightly annoying noises, motions.

6 - Uncomfortable: containing a number of annoyances.

7 - Very uncomfortable: everything annoying to the point of racking my nerves--excessive rocking, swaying, etc.

Subject Code: 33

Occupation:

Age; Sex: 19; male

Total flight experiences: 10

Flights in last 2 years: 10

Types of aircraft flown: general aviation

Attitude towards flying: Like very much.

Interpretation of comfort scale:

1 - Very comfortable: very rested, no feeling of flying.

2 - Comfortable: rested, average turbulence.

3 - Somewhat comfortable: occasional turbulence, but not enough to bother me.

4 - Neutral: ride seems to bother me for one reason or other.

5 - Somewhat uncomfortable: rough but I would not seem worried.

6 - Uncomfortable: rough, jerky--I would be bothered somewhat.

7 - Very uncomfortable: I would be very afraid--very rough and jerky.

Subject Code: 34

Occupation:

Age; Sex: 21; male

Total flight experiences: 6

Flights in last 2 years: 6

Types of aircraft flown: commercial

Attitude towards flying: I like it.

Interpretation of comfort scale:

1 - Very comfortable: not being able to tell you are moving.

2 - Comfortable: feeling of well being.

3 - Comewhat comfortable: at least enjoyable.

4 - Neutral: no opinion.

5 - Somewhat uncomfortable: unpleasant.

6 - Uncomfortable: distressing.

7 - Very uncomfortable: below toleration; causes my head to hurt.

APPENDIX C

SUBJECTS AND SEAT ASSIGNMENT, SCHEDULE OF TEST FLIGHTS, CABIN TEMPERATURE, AND SIX-DEGREE-OF-FREEDOM rms MOTIONS

TABLE C-1.- SUBJECTS AND SEAT ASSIGNMENTS

Subject Code	Total Flights	Seat Assignments																	
		325	326	327	328	332	333	334	349	350	351	352	353	354	355	356	357	358	359
03	2															9	10		
04	10	6	6			10					9	1	1	6	6	2	8		
05	2								1	10									
07	18	10	10	10	10	7	7	8	10	6	6	6	10	10	3	4	7	9	2
08	16	5	5	5	5	6	6	5			2	8	2	5	7	6	3	5	7
09	2															7	9		
12	15	8	8	8	8	9	9	10	7	2	10	9	4	8		10	2		
13	14	3	3	3	3	1	1	1	3	4	7	7	7	3	4				
14	4															5	4	1	8
15	18	2	2	2	2	4	4	4	9	8	8	10	3	2	8	8	5	2	5
19	4															3	6	8	1
20	13	1	1	1	1		3	3			4	3	6	1	10			3	6
21	7	4	4	4	4	3	2	2											
22	6	7	7	7	7		10	9											
23	10	9	9	9	9	8	8	7					9	9	2				
24	5			6	6	5	5	6											
25	7								2	5	5	5	8	4	5				
26	2								4	3									
27	4								5	7	3	4							
28	6								6	1	1	2				1	1		
29	2								8	9									
30	3												5	7	9				
31	2																	10	3
32	2																	7	9
33	2																	6	4
34	2																	4	10
TOTALS	178	10	10	10	10	9	10	10	10	10	10	10	10	10	9	10	10	10	10

TABLE C-2.- SCHEDULE OF UVA TEST FLIGHTS

Flight	Date	Time
325	Aug. 12	1300
326	Aug. 12	1515
327	Aug. 13	0857
328	Aug. 13	1202
332	Aug. 14	1545
333	Aug. 15	0902
334	Aug. 15	1100
349	Sept. 13	0845
350	Sept. 13	1023
351	Sept. 13	1348
352	Sept. 13	1532
353	Sept. 14	0834
354	Sept. 14	1110
355	Sept. 14	1349
356	Sept. 16	0852
357	Sept. 16	1055
358	Sept. 16	1357
359	Sept. 16	1538

TABLE C-3.- TEMPERATURE VARIATION AT TEST OBSERVER SEAT

Flight Number	Segment 1		Segment 2	
	°C	°F	°C	°F
325	27.8	82	22.2	72
326	27.8	82	22.2	72
327	26.7	80	22.2	72
328	27.8	82*	20.6	69*
332	31.1	88	23.3	74
333	25.6	78	22.8	73
334	27.8	82	24.4	76
349	27.8	82	25.6	78
350	28.9	84	26.7	80
351	31.1	88	24.4	76
352	27.8	82	25	77
353	27.8	82	23.9	75
354	27.8	82	25	77
355	25	77	23.3	74
356	21.7	71	21.7	71
357	26.1	79	27.2	81
358	27.8	82	29.4	85
359	28.9	84	28.3	83

*Recorded at seat 2.

TIFS FLIGHT 325 TOT 1 INSTRUMENTATION PEMS II DATE 8-12-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.02447632	.02743137	.00768036	.17438463	.17950766	.19819687
2	.02421012	.04861687	.00644337	.16140942	.10807868	.23729939
3	.02166818	.01757128	.00490500	.11013628	.08996666	.12318279
4	.02326800	.04299535	.00632843	.16833894	.09841037	.21685479
5	.02415326	.07112665	.00668162	.23264565	.11921829	.28896367
6	.02166495	.02767779	.00507445	.14419431	.09262343	.16861495
7	.02335680	.03600894	.00647464	.34017642	.29780698	.34915613
8	.02476429	.06453759	.00609319	.22173182	.12180722	.26054942
9	.02232420	.01974094	.00459336	.11371455	.09767036	.13494073
10	.02641174	.05247952	.00992124	.31942135	.12783192	.42892890
11	.04840351	.04600761	.00743256	.18164526	.13862179	.27637836
12	.04221137	.01719040	.00529908	.15934240	.11982904	.20248704
13	.04466878	.05965484	.00633309	.22846663	.12938702	.31058976
14	.04512649	.04075782	.00606943	.17409193	.11605033	.19765121
15	.04345342	.02933628	.00494995	.14288107	.11719215	.19343733
16	.04203927	.05570312	.00654966	.32479224	.18220593	.39015382
17	.04545987	.04384518	.00589737	.23693248	.11924345	.27605253
18	.04797291	.01852431	.00763649	.11936918	.11724334	.21638854
19	.04359472	.05333721	.00629158	.17009409	.12309346	.22325322
20	.04555327	.02796711	.00740905	.13189390	.11455130	.16052103

TIFS FLIGHT 326 TOT 15 INSTRUMENTATION PEMS II DATE 8-12-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.01926941	.01116244	.00589966	.12357184	.09528641	1.75028569
2	.03042269	.01334949	.01017595	.15182556	.14283557	4.28170527
3	.01743732	.01161852	.00504847	.11266321	.08458014	.86395602
4	.02468421	.01188234	.00781985	.16694011	.11465165	3.44165658
5	.02021831	.01087980	.00532062	.12389512	.10275699	1.73470459
6	.01999925	.01188150	.00585918	.32599080	.29580906	.90514640
7	.02346551	.01177710	.00701235	.13911865	.12305283	2.57023345
8	.02715290	.01156590	.00743115	.15525785	.11064809	3.41511347
9	.02995246	.01272164	.00932143	.21206839	.10738148	4.33428195
10	.02202544	.01325745	.00576958	.12059436	.11224081	1.75738442
11	.01964866	.01347368	.00831565	.17896089	.13536248	.96429249
12	.01850486	.01287866	.00573960	.19928121	.13890644	3.70364685
13	.01845427	.01360561	.00517330	.16178381	.15310127	1.88843851
14	.02347957	.01324387	.00845145	.24892971	.18655830	4.65950641
15	.01849649	.01369598	.00525528	.23558013	.17401437	2.79608655
16	.02048585	.01473194	.00798849	.29543527	.17889662	1.96629092
17	.01945096	.01316814	.00486796	.20417884	.17272522	3.69377855
18	.01890238	.01326424	.00585107	.31998437	.16174981	.97313411
19	.01987134	.01732479	.00664650	.22679065	.17689545	4.61779168
20	.01978560	.01311831	.00623041	.23532743	.16519685	2.77737286

TIFS FLIGHT 327 TDT 12 INSTRUMENTATION PEMS II DATE 8-13-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.03695403	.0E191628	.00893051	.38249183	.16479381	.52017305
2	.12622599	.0E213061	.00865829	.26491886	.21038061	.53046206
3	.0E868479	.0E200192	.01377970	.21309388	.20693960	.32747519
4	.15949295	.0E233068	.01385857	.56758259	.37412565	.86141163
5	.10204411	.0E727914	.01445718	.74552666	.37763739	1.48882504
6	.13233291	.0E792866	.00853487	.32505384	.22313897	.78767379
7	.06728224	.0E122011	.00740257	.27381746	.20397549	.60315006
8	.16005312	.0E128353	.00680221	.20112683	.22397991	.27280762
9	.09636649	.0E167882	.00709394	.15048256	.19592601	.29611484
10	.03849675	.0E202019	.01106074	.20533144	.17030267	.34132096
11	.02121980	.0E239907	.00649792	.41719300	.17054911	.57469122
12	.06687152	.0E238442	.00874837	.28676122	.23140009	.44032876
13	.09495051	.0E222734	.00869218	.30605862	.28942875	.43294341
14	.05160911	.0E211852	.01132828	.31290414	.22150621	.54056452
15	.08435046	.0E244755	.00765650	.28101957	.21837124	.44750419
16	.05634803	.0E271217	.00691571	.27970878	.22333159	.37051316
17	.10239629	.0E292295	.00625955	.30070584	.23666643	.47124304
18	.05159488	.0E301774	.02317693	.29550635	.19724350	.28530159
19	.08344579	.0E293634	.01312479	.42128375	.27165051	.76812108
20	.03572114	.0E290167	.00989965	.28366706	.16905620	.32615947

TIFS FLIGHT 328 TDT 2 INSTRUMENTATION PEMS II DATE 8-13-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.01717760	.01157540	.00717767	.24774382	.14245350	.52675421
2	.01941958	.01426569	.00547047	.44853094	.15737217	.76043409
3	.01715168	.01124500	.00590042	.30753211	.14760759	.57160135
4	.01732917	.01337685	.00673068	.52027877	.14205633	.48217217
5	.01899079	.01282731	.00596800	.34506521	.15064196	.48233606
6	.01665563	.01081758	.00845447	.29878253	.13982847	.52822344
7	.04440946	.01387696	.01053945	.47909289	.34396221	.71405182
8	.01840815	.01164732	.00549600	.36250517	.17287279	.56318736
9	.01700147	.01309695	.00658703	.43833777	.15135059	.50502475
10	.01802720	.01331953	.00604028	.53075418	.17183422	.42067802
11	.01948358	.01419437	.00717530	.35448554	.17034377	1.30395552
12	.01737498	.01114854	.00602229	.14797635	.15533512	1.14131503
13	.02134362	.01588868	.00535460	.54356232	.18546698	1.58000000
14	.02507608	.01317422	.00695263	.29119924	.18223062	1.44937918
15	.02213301	.01518058	.00549069	.55462600	.17382750	1.27412715
16	.01798527	.01378369	.00538424	.38305352	.15764200	1.15139046
17	.01795299	.01235273	.00611367	.26615597	.15200329	1.27773237
18	.01762952	.01372297	.00564252	.13328541	.16394816	1.15689239
19	.01850027	.01300038	.00625963	.35641268	.15367498	1.25015999
20	.02278618	.01715255	.00692127	.60753601	.16374065	1.26597788

TIFS FLIGHT 332 TDT 8 INSTRUMENTATION PEMS II DATE 8-14-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.05247094	.05564261	.00726189	.33564863	.30750285	.43896455
2	.10834205	.05492149	.01118928	.33286634	.18021376	.48540705
3	.03476924	.05059195	.00675892	.27706678	.13555442	.34303061
4	.14735271	.05441691	.00730103	.27040525	.20641705	.34813790
5	.08824341	.05802792	.00736329	.26294106	.17418668	.36133087
6	.03653218	.05672477	.00588685	.26018263	.15100993	.32956031
7	.08275908	.05724035	.00678027	.27976419	.15827192	.34259305
8	.05897372	.05484707	.00624732	.27104797	.14509997	.31805660
9	.15158166	.05095080	.00784385	.25843761	.21478827	.39627011
10	.11878552	.05904744	.00826008	.25574988	.12354351	.40066195
11	.11662761	.02124218	.00585747	.18952836	.16801190	.19864541
12	.15063864	.02283134	.00749853	.25019392	.23265640	.25978645
13	.05878265	.02225960	.00565641	.20559669	.12109087	.19740061
14	.08456299	.02122357	.00642822	.18458061	.13750636	.17866169
15	.03110177	.02028842	.00489326	.18001389	.11161093	.16863867
16	.11371016	.02108293	.00608490	.20145471	.15885528	.22501333
17	.10109402	.02240067	.00565034	.22584508	.18913223	.23154049
18	.15645127	.02217668	.00789968	.20649213	.18592741	.24339885
19	.03337214	.02415285	.00741681	.18635450	.13187115	.29439429
20	.06068117	.02191096	.00540999	.17944916	.12455521	.23376270

TIFS FLIGHT 333 TDT 10 INSTRUMENTATION PEMS II DATE 8-15-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.02532291	.01473363	.00705684	.22496444	.12321120	.27492544
2	.04485978	.01454098	.00597403	.23509998	.13809055	.26605075
3	.08102592	.01505789	.00693578	.26559932	.18943601	.35203693
4	.10149877	.01475584	.00707276	.36986484	.38030251	.40586944
5	.06213534	.01378623	.00564615	.20074113	.14275153	.25197024
6	.14677875	.01403674	.00694536	.22522655	.24437471	.25310472
7	.05492085	.01416333	.00943732	.19747911	.16488784	.17504000
8	.03202343	.01381629	.00594062	.21359775	.13085870	.23796638
9	.10945775	.01386605	.00613294	.31252680	.19545844	.57284378
10	.08962756	.02040221	.01418661	.59183613	.29513895	1.07396462
11	.08082265	.02563221	.00708703	.20899761	.16396951	.27198346
12	.10474254	.02771517	.00623418	.22082799	.18530785	.37956554
13	.03245766	.02544602	.00825803	.21161596	.12609917	.34774991
14	.05568752	.02568871	.00627001	.21833461	.14535130	.35171011
15	.00000000	.00000000	.00000000	.00000000	.00000000	.00000000
16	.06027437	.02663719	.00566157	.21450175	.12834719	.37018914
17	.11199554	.02568944	.00844251	.18882267	.18519719	.29697138
18	.13857128	.02535587	.00703932	.18890738	.21335182	.24052858
19	.03329865	.02479980	.00540009	.22283851	.11213831	.19769674
20	.06919899	.02964970	.00803604	.26067413	.31207852	.18044390

TIFS FLIGHT 334 TOT 3 INSTRUMENTATION PEMS II DATE 8-15-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.02931689	.01472583	.00799306	.43678370	.35751923	3.84421644
2	.02159745	.01352516	.00614117	.27798561	.11754999	5.13857957
3	.01673708	.01016218	.00578697	.19984494	.09765244	1.26138812
4	.03388805	.01351703	.00955761	.39969989	.19769168	6.50953147
5	.01893594	.01215072	.00668551	.31138080	.10442222	2.60894615
6	.02808861	.01303073	.00561489	.38242646	.17187495	8.90668288
7	.01812871	.01159483	.00467333	.26588343	.11475626	4.39044417
8	.02042156	.01169873	.00524814	.43171750	.16364901	11.27208942
9	.04138478	.01567546	.01228902	.73371657	.26145172	6.60984115
10	.01854978	.01170327	.00803069	.18491620	.10851728	2.23221863
11	.01849000	.01241894	.00553182	.19176287	.10327633	2.37886528
12	.03606938	.02425469	.00725403	.39539853	.16156732	7.02943810
13	.07274613	.03837317	.00816835	.64182552	.25808526	11.97622645
14	.04357964	.02118230	.01282926	.60705848	.20855934	4.88026639
15	.05111849	.03811168	.00883510	.52822344	.18343664	9.57794341
16	.06250840	.02885325	.01531470	.86021509	.43487929	2.83889063
17	.03619668	.02368860	.01043983	.35913786	.16613248	6.83015373
18	.03942715	.01484453	.01062826	.47076533	.19363884	2.09270160
19	.03882525	.02384450	.00909467	.34609247	.17173526	5.43755460
20	.01950308	.01669221	.00525852	.26659707	.11038116	4.03720200

TIFS FLIGHT 351 TOT 9 INSTRUMENTATION PEMS I DATE 9-13-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.02573000	.02589000	.01453000	.09644000	.11106000	.29394000
2	.05488000	.02809000	.01706000	.15072000	.16083000	.39247000
3	.10497000	.02882000	.01811000	.12363000	.20770000	.38525000
4	.04135000	.02525000	.01333000	.12492000	.12175000	.39813000
5	.07741000	.02740000	.01773000	.13658000	.13568000	.34631000
6	.04777000	.02717000	.01311000	.10016000	.13623000	.29908000
7	.11136000	.02583000	.01511000	.11339000	.17178000	.38540000
8	.03137000	.02715000	.01009000	.16994000	.16960000	.86563000
9	.09168000	.02896000	.02065000	.11617000	.16472000	.48610000
10	.71050000	.02820000	.01848000	.12143000	.14726000	.34453000
11	.06970000	.07231000	.01129000	.19156000	.14618000	.38018000
12	.12147000	.07543000	.01696000	.22001000	.19430000	.44536000
13	.03331000	.07575000	.01397000	.25287000	.20588000	.53435000
14	.09152000	.07585000	.01745000	.25259000	.16927000	.60447000
15	.05048000	.07165000	.01289000	.19485000	.17444000	.47284000
16	.12473000	.07380000	.01699000	.27641000	.22505000	.53480000
17	.07079000	.07645000	.00909000	.20059000	.14728000	.40841000
18	.09825000	.07562000	.01059000	.21424000	.16859000	.43586000
19	.04728000	.07409000	.00842000	.22216000	.13220000	.42415000
20	.03274000	.07488000	.01973000	.19676000	.15748000	.38890000

TIFS FLIGHT 352 TOT 14 INSTRUMENTATION PEMS I DATE 9-13-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.02111000	.00669000	.01485000	.25644000	.11542000	.47387000
2	.06498000	.00691000	.01544000	.22352000	.14645000	.45263000
3	.09740000	.00401000	.01520000	.23046000	.28286000	.46486000
4	.04772000	.00271000	.01248000	.27201000	.22270000	.84019000
5	.08610000	.00481000	.01460000	.26759000	.19408000	.71423000
6	.06330000	.00685000	.01529000	.24828000	.14991000	.54312000
7	.10661000	.00660000	.01188000	.29344000	.21766000	.70702000
8	.04519000	.00899000	.01466000	.27472000	.18105000	.44594000
9	.08696000	.00867000	.01659000	.30038000	.22263000	.65895000
10	.03160000	.00277000	.01558000	.24328000	.10451000	.45273000

TIFS FLIGHT 353 TOT 4 INSTRUMENTATION PEMS I DATE 9-14-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.06490377	.02826252	.00873149	.14572920	.32707797	.40689065
2	.06761509	.00329447	.00977870	.20290145	.15416225	.50459885
3	.06122744	.01528627	.01167733	.07922878	.14951923	.37245134
4	.06042351	.04695849	.01270748	.18325938	.18944128	.41535527
5	.05803447	.00887444	.01381014	.35984719	.25252525	.52020188
6	.06157191	.02437888	.01188949	.12412897	.16952286	.40319970
7	.06553396	.03744398	.01211280	.18695721	.15551206	.46929735
8	.06589385	.06173492	.01630767	.39720272	.18386408	.80864702
9	.06419190	.01486708	.01955940	.10604716	.14234465	.69920669
10	.06566354	.04782259	.01881994	.27136507	.16841021	.60972125
11	.03607984	.04384700	.01536587	.19722576	.13303383	.48381815
12	.03185906	.01419437	.01705989	.09914383	.10460880	.33639263
13	.03414821	.05799131	.01851405	.25951108	.12556672	.60817761
14	.03764572	.03610263	.02043869	.18367090	.14085099	.42698946
15	.03341257	.02731977	.01758607	.13199242	.12321932	.36548598
16	.03449928	.06250840	.02015043	.25074888	.19393556	.50613239
17	.03435113	.03918418	.01873179	.15324816	.12421353	.40767634
18	.03676275	.01288759	.01418485	.08556226	.11355615	.33048449
19	.03397499	.04852828	.01473567	.20136037	.15948041	.39456305
20	.02977784	.01898657	.01631594	.27735717	.14619508	.37601862

TIES FLIGHT 354 TDT 11 INSTRUMENTATION PEMS I DATE 9-14-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.00000000	.00000000	.00000000	.00000000	.00000000	.00000000
2	.02075572	.00962975	.02012734	.39381468	.19841008	1.06273233
3	.01754679	.01679912	.01102497	.40732051	.13322162	.28868788
4	.01574992	.01014577	.01778426	.13923721	.11318614	.28161143
5	.02248356	.01791219	.01623730	.29879926	.12570203	.33076245
6	.01963919	.01150172	.01792484	.14673786	.12209832	.38586271
7	.01698588	.01719886	.01392300	.43410628	.11959097	.61375891
8	.01916246	.01224780	.01775922	.21801376	.15667482	.83319866
9	.02258849	.01124900	.01845291	.53990740	.20414211	.81376981
10	.01778679	.01113059	.01404778	.23516078	.12292274	.46344363
11	.01842553	.00939319	.01648648	.07316630	.12144546	.63059496
12	.02130681	.01530784	.01605179	.25467430	.13102671	2.72343533
13	.01738620	.01013213	.01629755	.07639306	.11871394	.69862291
14	.01875713	.01529314	.01219754	.11272977	.11678476	2.08621667
15	.01761675	.00998743	.01599812	.10244999	.11899160	1.16554708
16	.02142359	.01467072	.01777020	.35493661	.12741272	3.12507680
17	.02222993	.01747760	.01721424	.64875265	.15824664	2.14081760
18	.01897681	.01430489	.01586285	.19384014	.11403947	2.52909075
19	.01756346	.00980811	.01234990	.10760576	.10251029	1.47698614
20	.01759830	.00992673	.01404564	.08113199	.10247439	.83210576

TIES FLIGHT 356 TDT 17 INSTRUMENTATION PEMS I DATE 9-14-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.01464000	.01475000	.01130000	.13027000	.11959000	.52831000
2	.01541000	.01778000	.01621000	.24240000	.11744000	.51027000
3	.01771000	.02481000	.02192000	.15511000	.21379000	.42928000
4	.01820000	.01497000	.01814000	.17866000	.14458000	.56237000
5	.01604000	.01478000	.02175000	.12616000	.12419000	.42633000
6	.01551000	.01798000	.02328000	.20318000	.14212000	.52831000
7	.01970000	.02867000	.01901000	.29864000	.19265000	.80255000
8	.01654000	.01510000	.02156000	.21648000	.14191000	.92939000
9	.02376000	.03133000	.02231000	.44956000	.23703000	.97077000
10	.02256000	.01496000	.02545000	.14090000	.19663000	.64813000
11	.07221000	.01126000	.02597000	.13437000	.19788000	.46324000
12	.06645000	.00784000	.01053000	.43350000	.22675000	1.08835000
13	.13356000	.01011000	.01921000	.12805000	.25725000	.65253000
14	.05307000	.00943000	.01921000	.11078000	.16358000	.36718000
15	.10643000	.01179000	.01412000	.06727000	.22484000	.29585000
16	.08123000	.00880000	.01084000	.07449000	.20474000	.29615000
17	.13155000	.00805000	.00670000	.06297000	.25831000	.29113000
18	.05427000	.00540000	.01780000	.06580000	.18218000	.33104000
19	.10711000	.00900000	.02094000	.06462000	.23079000	.27793000
20	.03459000	.00790000	.01765000	.08248000	.20246000	.26109000

TIES FLIGHT 356 TOT 16 INSTRUMENTATION RMS II DATE 9-15-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.04212244	.00309619	.00754983	.57303578	.48216180	.70428687
2	.13333417	.00256349	.00797139	.35455606	.26165053	.54381982
3	.06946006	.00418015	.00780006	.48795492	.32449961	.99235074
4	.16578902	.00529900	.01094715	.31892005	.20666156	.53372277
5	.10073728	.00527906	.00768505	.33420054	.18187083	.55965168
6	.13379088	.00556098	.01091696	.35358167	.18830560	.54658028
7	.07042869	.00663695	.00742489	.63210759	.52171831	.71184970
8	.16850902	.00595051	.00870867	.32709326	.14267796	.53228752
9	.10185265	.00599792	.00733417	.31305750	.12183596	.50155757
10	.03781799	.00627305	.00760723	.32405246	.11615076	.50808464
11	.02076897	.02284072	.00488416	.11210709	.10733126	.43040678
12	.05955754	.02181765	.00772451	.10251341	.12845622	.14387495
13	.10476641	.02199364	.01005634	.11090987	.17293351	.61967734
14	.04556107	.02274951	.00618078	.11542097	.12671227	.60545025
15	.08519096	.02286635	.00780577	.15866632	.17823860	.99390643
16	.06784246	.02369269	.00715192	.27349589	.16109935	.98360561
17	.11049434	.02351999	.00823408	.39758018	.39579035	1.01350876
18	.04418031	.02308398	.00787934	.24038303	.21067273	.39067890
19	.08646040	.02278025	.00750107	.11042645	.15249918	.32101402
20	.02561679	.02242387	.00584397	.16631897	.09975921	.38440864

TIES FLIGHT 357 TOT 6 INSTRUMENTATION RMS II DATE 9-16-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.00000000	.00000000	.00000000	.00000000	.00000000	.00000000
2	.00000000	.00000000	.00000000	.00000000	.00000000	.00000000
3	.02684139	.00998649	.00487545	.11972051	.10767079	.26078919
4	.06691487	.01392049	.00650792	2.23226343	1.48492424	1.65665325
5	.00000000	.00000000	.00000000	.00000000	.00000000	.00000000
6	.00000000	.00000000	.00000000	.00000000	.00000000	.00000000
7	.07147657	.01241249	.00770604	.45689167	.40926764	.81110419
8	.12694093	.01026207	.01011830	.14254122	.15033629	.25329824
9	.02823367	.01267123	.00524986	.10183320	.10245487	.42648564
10	.09884432	.00952938	.00847856	.09928494	.12465954	.20922715
11	.12416119	.00982079	.01002397	.10246463	.14013922	.17553002
12	.03542174	.01081788	.00666243	.52936755	.55549977	.84751991
13	.15129772	.01067005	.01487111	.20510241	.19603826	.59070297
14	.08856918	.01057544	.00828378	.14249561	.16979105	.48144574
15	.06237948	.01028008	.00549654	.13201894	.11123399	.27465251
16	.14216188	.01029077	.01060660	.10009995	.14508274	.20209404
17	.09241591	.01207228	.01062638	.12393143	.16871574	.38744032
18	.05028519	.01093572	.00945674	.09155872	.18827108	.17352521
19	.11523020	.01079166	.00899828	.13568346	.13291351	.22302242
20	.06832276	.01017202	.00642495	.09222906	.12064410	.16640012

TIFS FLIGHT 358 TDT 11 INSTRUMENTATION PEMS II DATE 9-16-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.03183866	.02327681	.00726244	.29456748	.12161826	.84826293
2	.03349328	.02460142	.00568630	.58668561	.11455130	.24496326
3	.00000000	.00000000	.00000000	.00000000	.00000000	.00000000
4	.03554434	.02602179	.00540934	.31378655	.12095040	.19838347
5	.03427681	.02189726	.00596984	.55213223	.28964634	.38157563
6	.03420380	.02368860	.00466487	.22016812	.09949724	.16003750
7	.03175374	.02552254	.00506498	.60255290	.09584258	.23455703
8	.03346640	.02369093	.00480905	.20337158	.12670438	.88908942
9	.03763110	.02663907	.00661377	.42143801	.13464769	.61712235
10	.03691883	.02451714	.00568920	.38503247	.13333792	.67423290
11	.03739652	.02438975	.00837401	.93652549	.96064562	1.05441927
12	.03528881	.02578701	.00720888	.14837116	.12068140	2.20837044
13	.03380976	.02506571	.00504183	.10295144	.09477763	.47313846
14	.03322650	.02434892	.00714864	.16568947	.10693456	1.58555984
15	.03690528	.02301891	.00532071	.10808793	.12609124	.87420249
16	.03131118	.02191301	.00653636	.44760474	.41948778	2.18481120
17	.03442092	.02521230	.00661823	.12941020	.10280564	1.47343137
18	.03512122	.02604439	.00796461	.16597590	.10925200	2.02467281
19	.03515821	.02405223	.00748071	.58691567	.62632260	1.34565969
20	.03508988	.02540354	.00547111	.25820147	.10300485	.95915067

TIFS FLIGHT 359 TDT 4 INSTRUMENTATION PEMS I DATE 9-16-74

SEGMENT	VERTICAL RMS G	TRANSVERSE RMS G	LONGITUDINAL RMS G	YAW RMS RAD/S	PITCH RMS RAD/S	ROLL RMS RAD/S
1	.06099590	.02495716	.01442359	.18988418	.16400000	.57971545
2	.06450736	.04734659	.01490067	.18060177	.15832561	.34465925
3	.05796464	.01381847	.01227599	.07796089	.13222708	.21453438
4	.05935487	.04159808	.01163959	.16229295	.12110326	.28338490
5	.06315457	.07120604	.01660181	.30727838	.17619371	.53255986
6	.06424484	.02587335	.01191050	.10830974	.18119051	.23758367
7	.06485754	.03626706	.01052996	.29564506	.20791104	.93738466
8	.06228804	.06465292	.01486708	.24907027	.16592167	.55332631
9	.06170089	.01659458	.01717149	.10408650	.17695197	.50866492
10	.06650414	.05047673	.01722701	.19844395	.21643013	.32666497
11	.03720753	.04484975	.00956112	.18453997	.13736448	.30131877
12	.03142388	.01572323	.01727628	.08968389	.10875201	.25400197
13	.03608185	.06035810	.01620961	.29994666	.18329484	.68899202
14	.04071732	.04076641	.02030197	.52475709	.26684010	.74539251
15	.03657595	.03133633	.01203287	.13253301	.15574017	.31767908
16	.03435986	.06619743	.01317156	.25628500	.12866235	.60359755
17	.03489126	.04121165	.01750943	.15894968	.11951151	.27708302
18	.03735773	.01649515	.01087152	.07112384	.12419742	.22846225
19	.03695944	.05061225	.01046900	.18839055	.10593394	.31524435
20	.04611833	.02054240	.02090215	.21964744	.25599219	.32054641